Vol. 40, No. 1 January, 1943

Psychological Bulletin

EDITED BY
JOHN E. ANDERSON, University of Minnesota

WITH THE CO-OPERATION OF
S. H. BRETT, George Washington University; W. T. HERON, University of Minnesota; W. A. HUNT, Wheaton College; J. G. JENKINS, University of Maryland; A. W. MELTON, University of Michigan; J. T. METCALF, University of Vermont.

CONTENTS

PUBLISHED MONTHLY (EXCEPT AUGUST AND SEPTEMBER)
BY THE AMERICAN PSYCHOLOGICAL ASSOCIATION, INC.
NORTHWESTERN UNIVERSITY, EVANSTON, ILLINOIS

Entered as second-class matter at the post office at Evanston, Illinois, and Menasha, Wisconsin.

Vol. 40, No. 1 January, 1943

Psychological Bulletin

MULTIPLY, VARY, LET THE STRONGEST LIVE AND THE WEAKEST DIE—CHARLES DARWIN[1]

BY CALVIN P. STONE
Stanford University

Even in remote times naturalists attempted to explain the origin and significance of diversity of instinctive behavior in animals. It was obvious to them that inherited patterns of behavior in bees and moths, songbirds and vultures, bears and hunting dogs were discontinuous phenomena. But how to account for discontinuity was indeed a baffling problem for the ancients; and so it is for scientists of the present day.

In 1842, the birth year of William James, whose life and work we are commemorating in the annual meeting of our Association, there were two widely held conceptions of the origin of diversity of instinctive behavior: *special creation* and *gradual evolution by the inheritance of adaptive habits.*

Special creationists generally regarded the species as immutable or permanent types. Major lines of diversity were assumed to have been created at the beginning of life on earth, or in successive eras thereafter, and minor diversities were ascribed to special circumstances of life which allowed individuals only in limited degrees to realize the fundamental characters of the species to which they belonged. Although the first half of the 19th century was not wholly free from dissenters from the foregoing conception of origin, it was lacking in variety of competing hypotheses which gave promise of unifying the legitimate speculation, hypotheses,

[1] Presidential Address for the Fiftieth Annual Meeting of the American Psychological Association. Because of the cancellation of the program of scientific papers scheduled for Boston and the substitution of a "skeletonized" business meeting in New York City in response to the request of the Office of Emergency Management that meetings be postponed for the duration of the war, this address, originally scheduled for Friday, September 4, 1942, was not delivered orally.

and facts of observation of that time. Quite appropriately the special creation theory was characterized as one that was "easy to scotch but hard to kill."

About 1801 Lamarck (17) made the inheritance of learned responses a basic postulate in his theory of gradual evolution of diversity in instincts. And so skillfully did he employ this postulate later on (1809) in the biological classic "Philosophie zoologique" to organize the available facts bearing on gradual evolution that his account temporarily overshadowed the earlier evolutionary theories of Buffon, St. Hilare, and Erasmus Darwin. It commanded the respectful attention of leading scientists on the continent, in Great Britain, and in the United States during three quarters of the 19th century. Spencer used it, Carpenter accepted it, Wundt endorsed it. Even Weismann who later sounded the death knell of this Lamarckian postulate actually countenanced it as late as 1880.

Lamarck assumed that all of the organisms of his time had descended from minute germs, the smallest and simplest of living matter, and that these germs were the product of spontaneous generation. As a general rule, behavioral patterns developed from the simple to the complex but under certain conditions progress was arrested and regressions set in. Basic was the assumption that circumstances of the *milieu externa* create in animals possessing a nervous system all of the fundamental "needs" (*besoins*) or "wants" relating to food, fecundation, avoidance of pain, and attainment of pleasure or happiness; and these, in turn, arouse adaptive movements which alleviate the needs. Changes of the living conditions regularly create new needs, or cause the alteration and disappearance of former needs thereby invoking disuse, waning and ultimate disappearance of adaptive movements, habits, or instinctive acts which had been functionally associated with them.

It naturally followed that whenever, for a considerable period of time, a group of closely related animals was isolated and subjected to circumstances of life (climate, geographical barriers, enemies, competition for space or food, etc.) which differed considerably from those to which the parent stock had been standardized in behavioral adaptations, a succession of variations eventuating in noticeable diversity would appear. Acting over only a short period of time, the altered circumstances would produce such minimal changes as one now observes between varieties

within a species and, over geological eras, such gross differences as are observable in our time between contemporary orders, genera, and classes. When external circumstances are relatively stable for a long period of time the individuals of a species living in close proximity eventually acquire approximately the same repertoire of adaptive habits. By virtue of this, when viewed in man's life-span, they may appear to be invariable from generation to generation and thus provide the illusion of immutability of species.

Lamarck assumed that slowly developed adaptive habits are changed into hereditary behavioral characters, which thereafter are transmitted from parent to offspring without the necessity of tuition or individual learning. The newly "acquired" instincts are subsequently modified by further additions and subtractions, each of which serves the biological end of adapting individuals or species to contemporary conditions of life. Thus one may regard each complex instinct of bees and moths, songbirds and vultures, bears and hunting dogs as the end-product of a finite number of successful adaptations made in the history of the species. Granting to Lamarck unlimited time and unlimited capacity in animals for the organization of adaptive movements which later become hereditary characters, we can hardly imagine a degree of instinctive specialization too complex to be accounted for by his theory of evolution.

But just how adaptive responses, individually learned, became transmissible by "generation"[2] was only superficially explained by Lamarck, this enigma of our day being passed over then as if only a commonplace fact of observation not worthy of prolonged discussion. Without questioning, he assumed that habits which have become stereotyped and well nigh invariable with practice in their use, which run their course without apparent conscious direction as human automatisms are perceived to do, and which tend similarly to appear in individuals of a group living together, are the *veritable* essences of hereditary characters.

Lamarck did not deal systematically with the interrelationships of homeostatic mechanisms as did Claud Bernard in the sixties or Walter B. Cannon in the past two decades. He did not clearly distinguish between agencies which initiate changes in the instincts of a species and those which bring to fruition in the in-

[2] The term "generation" is roughly equivalent to our concept of sexual reproduction. In Darwin's time "congenital" was an alternative for hereditary.

dividual, in sequential order, the distinctive innate characters which differentiate between young and adults, adults and old, males and females, or the like-sex workers and queens among the bees and the ants. He said little to stimulate detailed study of the interplay of instinctive activities in animal populations, a topic more thoroughly understood by later workers, particularly the founders of the science of animal ecology. Nevertheless, Lamarck did psychobiology a service by according to behavioral evolution a place no less prominent than form and structure, an evaulation no one has rejected. He asserted with emphasis that behavioral adaptations are necessary forerunners or accompaniments of structural changes, the latter resulting from use and disuse of existing parts of the body. By attending to co-variations of adaptive movements and structural adaptations he was able to envisage a closely interwoven causal nexus in which the evolution of well-nigh countless correlated structures, forms, and instinctive acts has occurred in bygone eras (and may be occurring today), these having interrelations which hitherto had baffled the understanding of every naturalist who had witnessed and described them. Lamarck perceived and convincingly argued that no theory of descent could win adherents unless it gave a plausible account of the evolution of animal instincts. Probably more than any other scientist before his time he set the stage for fundamental speculation, observation, theorizing, and research on the origin of diversity in instinctive behavior. This has been a major interest of leading evolutionists during the past one hundred years.

The Evolution of Instincts by Natural Selection

A relatively independent point of view concerning the evolution of instincts began to take shape in the mind of Charles Darwin in 1842, the year of William James' birth. Referring to the earliest formulation of his views he says, in his autobiography (6), "In June 1842 I first allowed myself the satisfaction of writing a very brief abstract of my theory in pencil in 35 pages; and this was enlarged during the summer of 1844 into one of 230 pages, which I had fairly copied out and still possess." His son, Francis, who published these manuscripts in 1909 says that the 1842 paper "only came to light after my mother's death in 1896 when the house at Down was vacated. The Mss. was hidden in a cupboard under the stairs which was not used for papers of any value but rather as an overflow for matter which he did not wish to destroy" (7).

Doubt as to the immutability of species had not seriously occupied Darwin's mind prior to his voyage on the Beagle and the years immediately afterward (1837–39) when he was arranging and interpreting the observations made by himself and other scientists who reported on this voyage. So omnipresent had been behavioral variations in whatever instincts he chose to observe that it seemed he had only to discover rigorous selecting and isolating agents, capable of summating similarly oriented variations for a long period of time, to account for a degree of diversity equalling that found in local races of well-known species or in related species inhabiting islands which once were connected with the mainland.

By 1842 he had no doubt as to the demonstrability of ever-continuing variations in the instinctive behavior of all extant species living under conditions of domestication or in the feral state. And so far as he then could determine, *a priori*, there was no law of nature which limited the kind, the direction, the amount, or the perpetuity of variation in instinctive behavior. Already he had arrived at the conclusion which prompted him to say, in the first edition of the "Origin,"

> . . . it may not be a logical deduction, but to my imagination it is far more satisfactory to look at such instincts as the young cuckoo ejecting its foster-brothers,—ants making slaves,—the larvae of *Ichneumonidae* feeding within the live bodies of caterpillars,—not as specially endowed or created instincts, but as small consequences of one general law, leading to the advancement of all organic beings, namely, multiply, vary, let the strongest live and the weakest die (**4**, p. 244).

1. *Scope and limitation:* Darwin did not attempt in the first enunciation of his views to account for the "first origins of instincts and other mental attributes." He desired only to show how diversity could possibly have occurred in the great groups of animals of his day. He spoke, for example, of such instinctive acts as we commonly designate by the terms *fear*, *timidity*, and *wildness;* of those conditioned by diurnal or seasonal states of the body such as sleeping, hibernation, migration, and fecundation; of consensual movements such as pacing or trotting, erratic flying of "tumbler" pigeons, and pointing and shepherding in certain breeds of dogs; and of the so-called "industries" of animals, such as spinning of cocoons by insect larvae, fabrication of nests by weaver birds, erection of dams by beavers, construction of diverse kinds of cells by bees and wasps, and complicated family routines of the social insects pertaining to nursing, feeding, and the defense of young. These and others not enumerated could vary in respect to detail

of pattern, strength and perseverance, age at first appearance, latency or patency in successive generations, dependence on experience for normal development, or susceptibility to modification by tuition and the particular life situations for which the true instincts were not suited.

2. *Definition.* He perceived the difficulty of formulating a precise definition of instinct. While reminding himself in the 1842 essays[3] to define instinct, he merely discusses some of the important items the concept should entail. The context, however, indicates that he intended it to embrace (1) the more corporeal unlearned activities of animals which obey the same laws of transmission as structural traits when fertile races or interfertile species or genera are hybridized, and (2) complex acts in which the motivating impulse arises from conditions having an hereditary base, but in which quite variable details of behavior might appear as, for example, the migratory journeys of birds or reindeer.[4]

In the "Origin of Species" (1859), Darwin again avoided defining instinct on the ground that everyone understood what the term meant when it was used in a specific instance. Continuing, he says:

> An action, which we ourselves should require experience to enable us to perform, when performed by an animal, more especially by a very young one, without any experience, and when performed by many individuals in the same way, without their knowing for what purpose it is performed, is usually said to be instinctive. But I could show that none of these characters of instinct are universal. A little dose, as Pierre Huber expresses it, of judgment or reason, often comes into play, even in animals very low in the scale of nature (**4**, p. 207).

With this conception, which was not entirely original with him, he was never satisfied, nevertheless he retained it unaltered in each

[3] In the 1842 essay he jotted down the words "Lord Broughham's definition" at a point where his own conception must have been in mind. But it is doubtful whether he expected to quote this definition, for in expanding this section later he merely says that "Lord Broughham insists strongly on ignorance of the end proposed being eminently characteristic of true instincts" (**7**, p. 117). It would seem that the jotting was to remind him to say that, in respect to ignorance of end, acquired instincts (habits which have become hereditary) differ in no essential way from the true instincts which are summations of variations naturally occurring in animals living in the feral state.

[4] I shall not deal with this aspect of the problem today. The subject received considerable attention at the hands of Romanes, Lloyd Morgan, and animal biologists during the last quarter of the nineteenth century. In the period beyond 1920 interest has been revived in the topic by students of animal migrations and also by those working in the field of animal drives.

revision of the "Origin," the last being completed in 1872. Although later authors have emended and possibly improved upon this basic idea, no one so far has been able to define the term in a manner satisfactory to all who have occasion to use it. The multiplication of diverse phenomena embraced by the word *instinct* has made it one of the most uncertain and abused words in the lexicon of psychological terms during the past 100 years. And recent attempts to banish it from general usage have accomplished little by way of freeing our science from the dilemma of multiple meanings. Unfortunately, these attempts are working to our disadvantage by diverting the attention of young researchers from a wealth of behavioral phenomena which are known to have great, although as yet not fully evaluated, theoretical and practical implications.

Variation

Darwin foresaw the necessity of accounting as fully as possible for all behavioral variations that could possibly have contributed significantly to divergence from one or a few parent stocks. Variations were the building stones of evolution theory then, as they are today.

Believing that most variations in habits due to short-term influences, such as food deprivation, illness, injury, or exposure to heat or cold, were rarely if ever transmitted by "generation" and therefore could have had but little weight, he dismissed them as a class from consideration. A high degree of conjecture and arbitrariness on his part gave rise to inconsistencies and no small degree of confusion among those who regarded him an authority.

Although then unable to decipher the basic distinctions between the acquisitions belonging to the somatoplasm and those belonging to the germ plasm, as did Weismann and others in the eighties, he had no doubt as to the gonads playing an important if not essential role in the transmission of hereditary characters. While psychobiologists have been in essential agreement with this early conclusion, they dared not accept his judgment as to what individually developed responses originally had or later attained hereditary status. Darwin always was a very unreliable prophet on this point, as also were some of his followers during the latter third of the nineteenth century.

In these early essays he discussed chiefly two kinds of variation which could possibly have been the sources from which diversity in instinctive behavior arose: namely, (1) Differential habit forma-

tion, to which adhered the belief that some habit variants which fortuitously have adaptive value in the struggle for survival and are slowly acquired may attain hereditary status, and thereafter be passed from parents to offspring as "acquired" instincts without the necessity of practice; and (2) Gross hereditary variations of the saltatory type, known in his time as "sports," and small hereditary variations some of which are so minute as to require summation in successive generations before becoming noticeable to naturalists or animal fanciers. He desired to explain the diversification of instincts so reasonably that no thoughtful sceptic would reject the "theory of common descent of allied organisms from the difficulty of imagining the transitional stages in the various now most complicated and wonderful instincts." In so doing he gave about equal weight to the inheritance of learned responses and to hereditary variations. The following quotations reflect his views:

> . . . almost infinitely numerous shades of disposition, of tastes, of peculiar movements, and even of individual actions, can be modified or acquired by one individual and transmitted to its offspring. . . . The inherited paces in the horse have no doubt been acquired by compulsion during the lives of the parents: and temper and tameness may be modified in a breed by the treatment which the individuals receive (7, p. 115).
>
> The "transandantes" sheep in Spain, which for some centuries have been yearly taken a journey of several hundred miles from one province to another, know when the time comes, and show the greatest restlessness (like migratory birds in confinement), and are prevented with difficulty from starting by themselves, which they sometimes do, and find their own way. There is a case on good evidence of a sheep which, when she lambed, would return across a mountainous country to her own birth-place, although at other times of year not of a rambling disposition. Her lambs inherited this same disposition, and would go to produce their young on the farm whence their parent came; and so troublesome was this habit that the whole family was destroyed (7, p. 114).
>
> I will briefly consider . . . one other class of instincts, which have often been advanced as truly wonderful, namely parents bringing food to their young which they themselves neither like nor partake of;—for instance, the common sparrow, a granivorous bird, feeding its young with caterpillars. . . . We may suppose either that the remote stock, whence the sparrow and other congenerous birds have descended, was insectivorous, and that its own habits and structures have been changed, whilst its ancient instincts with respect to its young have remained unchanged; or we may suppose that the parents have been induced to vary slightly the food of their young, by a slight scarcity of the proper kind (or by the instincts of some individuals not being so truly developed), and in this case those young which were most capable of surviving were necessarily most often preserved, and would themselves in time become parents, and would be similarly compelled to alter their food for their young (7, p. 126).

Once grant that dispositions, tastes, actions or habits can be slightly modified, either by slight congenital differences (we must suppose in the brain) or by the force of external circumstances, and that such slight modifications can be rendered inheritable,—a proposition which no one can reject,—and it will be difficult to put any limit to the complexity and wonder of the tastes and habits which may *possibly* be thus acquired (**7**, p. 126).

1. The "acquired" instincts. Whether Darwin had any misgivings in asserting that certain habits attain hereditary status cannot be determined from his earliest writings, but I am inclined to believe that he did not. The idea was not new. For almost a quarter of a century scientists had freely utilized it. Hence, he had no reason to fear that criticism of this assumption would "backfire" on the theory of descent, which it was intended to support. A few years later, quite independently, Spencer employed the idea without apology in his account of the compounding of reflexes to form new instincts or to alter the old ones. The method of compounding described was simple associative learning, in which contiguous factors of the external environment cause simple reflexes to be repeated again and again in particular orders and temporal spacings. Somehow, with many repetitions, these associated reflexes become fixed as hereditary compounds and are thereafter transmitted from one generation to another without the necessity of practice or repetition.

After some experimentation on pigeons and further consideration of facts collected from other sources, Darwin was disposed to de-emphasize the importance of "acquired" instincts as compared with hereditary variations. This was apparent in 1859, in the first edition of the "Origin of Species" and albeit with some wavering it continued for several years thereafter. Nonetheless he attempted to develop a provisional hypothesis that would serve several purposes, one of which was to explain the mechanism whereby habits can attain hereditary status. This he published (**5**) in 1865 under the name *pangenesis*. Today pangenesis has only historical significance; but in the sixties and for about three decades thereafter it served as a unifying principle for the coordination of a multiplicity of discordant beliefs and facts of observation.

This theory, so far as it applies to behavior, stipulates that every cell of the body, in every stage of life, discharges into the circulation minute particles or gemmules. The latter multiply by fission, at the same time preserving their essential characteristics and congregating in the gonads, particularly in the sperm and the

ova. They mingle but preserve their identities at the time of fertilization and thus provide a liaison mechanism between parents and offspring. The gemmules have an affinity for nacent cells of the type which originally produced them and exert a controlling influence upon their proliferation and activities so as to cause them to recapitulate forms and functions which were characteristic of, or even peculiar to, the parents at specific ages. Assuming that cells of the nervous system mediate all adaptive movements, it naturally followed that the nerve cells responsible for specific habits in the parents would pass on to the offspring a heritage of gemmules capable of instating in these young a specific response or a repertoire of parent-like responses. No practice was required in typical instances and, since the gemmules were presumed to act at precisely the same age in the offspring as that in which the habits were developed in the parents, he could thus explain the origin of temporal and serial schedules which the instincts follow in their initial manifestation. Obviously the annexation of "acquired" instincts at any point on the life line, from the embryo to the aged, provided one of the most fertile sources of variation with which selective and isolating agencies could operate to produce some of the kinds of diversity present in our day.

To give full details of the workings of gemmules is not our intention. Suffice it to say, however, that this ingenious theory of the mechanism of transmission of learned responses was applicable also to the modification and transmission of true instincts. Furthermore it offered an explanation of latent instincts, reversion, blending, saltation, and dominance. The list is not exhaustive. Even the difficult case of graniferous sparrows which fed their young on larvae which they neither ate nor liked for themselves yielded to pangenesis. It was truly an all-purpose theory, directed to the inscrutable as well as the orderly processes of "generation."

In the mind of Darwin, pangenesis was only a provisional theory. It should stand or fall by the force of evidence submitted for and against it. He had not long to wait because in 1871 his cousin Francis Galton (11) devised an experimental method by which to put it on trial. He transfused the blood of one race of rabbits with distinctive morphological and behavioral characters into another that had noteworthy differences in homologous characters. Then, as soon as possible, he bred the recipients of the foreign blood to animals of their own race and awaited the appearance of characteristics of the blood donors in offspring from these

matings. He assumed that gemmules from the blood of the donors would find their way into the sperm and/or ova of the hosts and thence into the offspring where they would exercise their usual functions in the manner hypothecated by Darwin. Not a single offspring in a rather elaborate series of tests showed behavior or morphological characters which deviated in the direction of the donors of blood. While not a perfect test of the theory, as Galton admitted, these experiments nevertheless had some weight on the negative side of the ledger. In 1875, Galton (**12**) published an alternative theory of heredity in which he assigned to the germ cells full responsibility, without aid of gemmules from the somatoplasm, of transmitting hereditary characters from parents to offspring. This paper denied the possibility of learned responses attaining hereditary status and thus altogether eliminated the "acquired" instincts from consideration. Eight years after this paper appeared Weismann gave substantial support to Galton's point of view in his epoch making treatise on the continuity of the germ plasm. This placed a stricture upon the Lamarckian hypothesis that on *a priori* grounds made it unacceptable to many scientists immediately thereafter.

Among certain men, however, the theory of pangenesis or derivatives therefrom continued to flourish, and further experiments were designed to put it under stress, among them being experiments relating to telegony. The upholders of telegony believed that the blood of a female which bore a hybrid offspring became contaminated ("infected") during the gestation period with the result that this condition would give to subsequent pureline offspring some of the characters of the hybrid. Thus an equine colt borne by a mother which the previous year had borne a mule-colt would have mulish characteristics; a pedigreed bitch if allowed to produce a litter by a mongrel sire would, when next mated to a pedigreed male of her own breed, bear one or more pups resembling the mongrel. Against this popular conception the celebrated Penycuik (**9**) experiment provided telling evidence. Equine mares were mated with a zebra stallion and allowed to rear hybrid offspring; then followed matings of the same mares with equine stallions. The behavioral traits of wildness, viciousness, and excitability of the zebra should have appeared in the equine foals, but none of them did. Bearing indirectly on telegony is the classical experiment of Heap (1890) in which two fertilized ova of the Angora breed of rabbits were introduced into the Fallopian tube

of a Belgian hare (**13**). These fertilized eggs developed into normal Angora rabbits which in no way appeared to deviate from the characteristic features of their true parents. Finally, in 1902 telegony was conclusively disproven by Darbishire (**3**) in a systematic study of the whirling tendency in "dancing" mice. Non-whirling mothers which had borne offspring begotten by dancer males were subsequently mated to non-dancer males. In no instance did whirlers appear from these matings.

Darwin personally supplied only inferential evidence in support of the inheritance of learned responses and for many years only anecdotal evidence was supplied by others. In the seventies, however, Brown-Séquard reported behavior data which were interpreted as giving it support. He described a small number of epileptic convulsions in guinea pigs which were the offspring of parents in which epileptic convulsions had been produced experimentally by lesions in the spinal cord or in the sciatic nerve. A few years later Romanes repeated these experiments with only here and there a result that supported the claims of his predecessor. Neither of these studies was convincing to careful experimenters of that time because of inadequate controls of the genetic stock, the operations, and the symptoms displayed. William James (**15**) did psychology an invaluable service in subjecting this experiment to thoughtful scrutiny in his "Principles of Psychology" (1890), and in that connection reviewing a great deal of morphological and behavioral data previously offered in support of the inheritance of acquired characters. To his credit, be it said, he found it totally unconvincing.

Within recent years the most sincere and persistent attempt to cause a learned response to attain hereditary status was that of McDougall (**19**). Unfortunately, the results have been most difficult to interpret, both for him and for others, due, in part, to the fact that complete records regarding the animals discarded as well as those experimented upon were not preserved for retrospective consideration. With some reservations, however, McDougall interpreted his results as favoring the Lamarckian hypothesis; others, competent to review them, have preferred to suspend judgment or to presume that reductions in learning rate such as he has obtained would most likely arise from unintentional selective breeding. Whatever the final interpretation of these studies may be, we may say now that in the final stages of the experiments it was apparent to McDougall and to others that nothing even closely

resembling an "acquired" instinct was being set up. McDougall was unable to contrive a method of forcing the acquired responses into the germ plasm.

In view of the foregoing and still other lines of negative evidence, should we say, or hope, that the inheritance of learned responses as a source of hereditary variations is a dead issue? Neither would be justified. To a degree unequaled by any other postulate so far advanced, this conception superficially accounts for the small and the great steps in the evolution of diversity in a manner that is satisfying both to personal experience and to imagination. While this condition obtains, there will be able experimenters seeking new ways of making tenable what hitherto has been an unverified postulate.

2. *Hereditary variations.* Hereditary variations of the true and the "acquired" instincts, occurring in every direction, were considered the fundamental sources from which selecting and isolating agencies might create noteworthy diversity. Neither in 1842 nor in later years did Darwin assign much weight to gross variations as exemplified by "sports," except possibly when these were cultivated by man under artificial conditions. Telling against their importance was their rarity, and for that reason the small chance they would have in making their influence felt in competition with other animals already standardized for conditions then existing; also, among animals, as opposed to plants, the vast majority of "sports" described in the literature were monstrosities which because of organic weakness only rarely survived and begot offspring. Of course there were exceptions. The erratic flight of the tumbler pigeon might be considered an example of a "sport" that has been able to perpetuate its kind under conditions of domestication and selective breeding by pigeon fanciers, but which under natural conditions probably would never have become established as a variety or race. So also the pointing by bird dogs might be looked upon as a "sport" since this tendency was known to crop out now and then among various breeds without tuition; quite probably it had been preserved by dog fanciers through isolation and selective mating of individuals in which this novel response had appeared.

Since unequivocal examples of "sports" perpetuating themselves in the feral state were rare, there seemed to be no logical ground for questioning the wisdom of placing the chief burden on small variations. Moreover, this step was consistent with a basic tenet of Darwin's theory of descent which envisaged the abruptness

of transitions between behavioral series relating to any fundamental instinct, such as nesting in reptiles, birds, and rodents, as the result of sporadic extinction of intermediates from a long line of ancestral stocks,—these exhibiting continuous variations and extending from remote antiquity to the present day.

A growing interest in discontinuous variation was apparent toward the end of the nineteenth century, owing largely to de Vries' extensive work on mutant plants that were normal in development, fertile *inter se*, and infertile or less fertile when crossed with ancestral or unrelated stock. Here in one generation was notable diversity and with it an isolating mechanism by which the swamping effects of hybridization might be minimized or obviated while the new type was becoming established. This work led de Vries to discard Darwin's theory of pangenesis and to question his belief that continuous variations provided the major sources for diversification. In this he was materially supported by Bateson and other geneticists of that period. Their work, together with numerous advances in knowledge of cell structure, particularly the chromosomal constituents of the nuclei, and the significance of meiosis, knowledge which for the most part had gradually accumulated for approximately 25 years, laid a foundation for immediate appreciation of Mendel's paper of 1866, the main tenets of which were independently confirmed by de Vries, Correns, and Tschermak in 1900.

In 1902 Darbishire (**3**) demonstrated that the Mendelian principles could be applied to behavioral characters of the Japanese waltzing mouse. Experimental studies by a number of competent observers had indicated that this type of locomotion is not acquired by imitation or learned through tuition or practice. It appears late in the nursing period and, although subject to minor variations due to environmental influences, is not unlike other stable patterns of instinctive behavior. Darbishire crossed pure-line waltzers with pure-line European albinos that were free from the whirling tendency. All of the F_1 generation, the number running into the hundreds, were free from the waltzing behavior. The F_1 hybrids when crossed *inter se* gave ratios of 4 normal to 1 waltzer, instead of the expected number if one assumes that waltzing is a recessive unit character. Subsequent experiments by other workers make the latter assumption tenable and yield the expected ratios. Needless to say, Darbishire's demonstration that an unlearned behavioral pattern is transmitted in breeding tests, somewhat as morphological characters are, tended to stimulate new lines of research

on the heredity of instinctive dispositions. Among the most striking of these were studies on laying hens.

The first egg-laying contest of national scope was held in England in 1897. Prior to that time practical poultry breeders had selected birds which matured early, laid eggs in the "off season," and did not interrupt the laying sequence with periods of broodiness. Although pure lines had not been developed in all of these traits, considerable progress in that direction had been made with respect to broodiness and early maturity,—sufficient at least to suggest the following tests. Hurst, in 1903, crossed pure-line Cochins with pure-line Black Hamburghs (**14**). All of the hens of the F_1 generation were good "sitters," broodiness usually appearing after the hens had laid about a dozen eggs. In this respect they resembled the Cochin but not the Hamburgh strain. The F_2 generation segregated so as to give a ratio of 3 broody hens to 1 non-broody hen. Further tests support the assumption that broodiness is transmitted as a dominant unit character and non-broodiness as a recessive unit character. Table I gives additional data showing the outcome of crossing several genetic types of males and females derived from White Leghorn and White Wyandotte races. Incomplete dominance, or possibly impurity of the original strains, may account for the ratios deviating somewhat more from the calculated ratios than would be expected. Excesses of non-broody hens sometimes result from the fact than an occasional broody-type does not display the broody behavior until the second year; correction for these cases harmonizes the empirical and the calculated ratios.

Before discussing the onset of laying in domestic hens, geneticists must make certain arbitrary distinctions as to what constitutes early and late layers. Provisionally, those beginning to lay between the ages of 4 and 8 months are designated as early, and those beginning between the ages of 9 and 13 months as late layers (**14**). Now if homozygous "earlies" are crossed with homozygous "lates" the F_1 generation tends to fall, with but few exceptions, into the category of "earlies." When the F_1 males and females are interbred their F_2 females approximate the ratio of 3 "earlies" to 1 "late." The results from back crosses and other experimental matings support the hypothesis that early maturity behaves as a dominant, and late maturity as a recessive unit character. Table II gives results from crossing animals whose gamete formulae are conjectured by controlled matings of the an-

TABLE I

BROODINESS (H FACTOR)

Daughters sired by White Leghorns and White Wyandottes
H = broody; h = non-broody From Hurst (**14**, p. 492)

Matings				*Offspring*	*B. Grades (times Broody first season)*							*Observed*		*Calculated*		
Sires		*Dams*		*Daughters*	*Broody*						*Non-Broody*					
Nos.	*Factors*	*Nos.*	*Factors*	*Nos.*	*6*	*5*	*4*	*3*	*2*	*1*	*0*	*Broody*	*Non-Broody*	*Broody*	*Non-Broody*	
1	hh	2	HH	6	—	—	1	1	1	3	—	6	0	6.00	0.00	A
1	Hh	2	Hh	10	—	—	1	1	4	—	4	6	4	7.50	2.50	B
2	Hh	3	hh	40	2	1	—	3	6	4	24	16	24	20.00	20.00	C
6	hh	18	Hh	50	—	—	1	6	5	5	33	17	33	25.00	25.00	C
13	hh	41	hh	95	—	—	—	2	2	1	90	5	90	0.00	95.00	D
23	—	66	—	201	2	1	3	13	18	13	151	50	151	58.50	142.50	

Mendelian expectation: A—all Broody; B—3 Broody, 1 Non-broody; C—1 Broody, 1 Non-broody; D—all Non-Broody.

TABLE II

SEXUAL MATURITY (AGE AT FIRST EGG; E FACTOR)
Daughters sired by White Leghorns and White Wyandottes
E=early; e=late From Hurst (**14**, p. 477)

Matings				*Offspring*	*S.M. Grades (months of 30 days)*										*Observed*		*Calculated*		
Sires		*Dams*		*Daughters*	*Early*						*Late*								
Nos.	*Factors*	*Nos.*	*Factors*	*Nos.*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*Early*	*Late*	*Early*	*Late*	
9	EE	11	EE	61	1	12	23	20	5	—	—	—	—	—	61	0	61.00	0.00	A
9	EE	35	Ee	104	—	3	39	35	24	3	—	—	—	—	101	3	104.00	0.00	
2	Ee	3	EE	18	—	3	7	8	—	—	—	—	—	—	18	0	18.00	0.00	
3	EE	3	ee	23	—	—	4	11	8	—	—	—	—	—	23	0	23.00	0.00	
6	Ee	21	Ee	82	—	—	16	19	25	13	5	3	1	—	60	22	61.50	20.50	B
1	Ee	7	ee	28	—	—	1	7	5	6	9	—	—	—	13	15	14.00	14.00	C
2	ee	4	Ee	15	—	—	—	2	7	3	3	—	—	—	9	6	7.50	7.50	
1	ee	1	ee	4	—	—	—	—	1	1	1	—	—	1	1	3	0.00	4.00	D
33	—	85	—	335	1	18	90	102	75	26	18	3	1	1	286	49	289.00	46.00	

Mendelian expectations: A—all Early; B—3 Early, 1 Late; C—1 Early, 1 Late; D—all Late.

cestral stock. The empirical data conform rather closely to the calculated data. Onset of egg-laying, a sex-limited activity, is closely related to age of first estrus in domestic fowls. Although one cannot definitely say that early and late behavioral sexual maturity will behave as onset of egg-laying in genetic tests, there is analagous evidence that I shall not discuss which clearly indicates that this would be the result.

Still other applications of the Mendelian method of studying variation and inheritance of instinctive reactions might be given. The number of cases, however, is extremely small as compared with that in which somatic characters have been studied. This is due in part to rarity of inter-specific fertility between species that have distinctive homologous instincts. It is due also to the decided preference geneticists have shown for structural, as contrasted with functional, characters. Animal psycholgists, for some unknown reason, have not had even sufficient interest in the topic to keep the growing literature assembled, to say nothing of preparing themselves for creditable research in the field. Fortunately, a few biologists are again developing interests in this subject and are taking the necessary steps to determine within what limits the laws of variation derived from studies of the transmission of structures may be applied to representative instinctive and other behavioral characters.

3. Instigation and Realization: In 1842 Darwin had only tentative suggestions relating to the initiation of hereditary variations. Without thoroughly weighing the matter he stated that significant diversity could arise from the interbreeding of races in which behavioral homologues were noticeably different, e.g., wildness, timidity, or ferocity. In developing this point he said, in 1844,

> When once two or more races are formed, or if more than one race, or species fertile *inter se*, originally existed in a wild state, their crossing becomes a most copious source of new races. When two well-marked races are crossed the offspring in the first generation take more or less after either parent or are quite intermediate between them, or rarely assume characters in some degree new. In the second and several succeeding generations, the offspring are generally found to vary exceedingly, one compared with another, and many revert to their ancestral forms. This greater variability in succeeding generations seems analogous to the breaking or variability of organic beings after having been bred for some generations under domestication (**7**, p. 68).

In the "Origin" he de-emphasized the importance of crossing of races or species as a means of initiating variations which, having

adaptive value, might be the initial step in diversification. The change in viewpoint expressed in 1859 probably resulted from his experiences in pigeon breeding wherein he observed the rapidity with which a mongrel race develops when indiscriminate matings are permitted between two initially different races, as most probably would obtain in nature. In the main his final viewpoint was not unlike that expressed by scientists of our day. Hybridization ordinarily adds nothing, except possibly in rare instances in which it accelerates the rate of mutation (**8**). It chiefly reveals.

In keeping with beliefs commonly held in 1842 Darwin stated that various agents might act directly upon the germ cells so as to instigate hereditary variations. The most important of these were diet, climate, toxic and infectious agents, and sudden changes in living conditions. For many years he spoke of the profuseness of variation occurring in domesticated animals and especially the sudden changes produced by bringing them from the wild state to an artificial habitat. He believed that these agencies somehow caused the reproductive organs to fail "in their ordinary functions of producing new organic beings closely like their parents." Today we speak of two, and only two, processes initiating hereditary variation: namely, gene mutation and chromosomal changes. To these are accredited all initial variation, whether small or large, continuous or discrete. The agencies mentioned by Darwin have significance only if they effect mutations of genes or produce chromosomal changes. So far the vast majority of these initial changes have occurred spontaneously, i.e., from causes largely unknown. Recently a few noteworthy somatic mutations have been caused by irradiation of the germinal cells.

In making the foregoing summary statements I have omitted essential landmarks in the unfolding of discoveries relating to initiation of variations; to some of these we now return.

a. Sex determination: Between 1875 and 1900 the main points relating to *maturation* of the germ cells and the union of nuclei from ovum and sperm had been revealed; yet no one as yet had a clue to the solution of the age-old problem of sex determination. MacClung in 1902 found an accessory chromosome in insects which he related to sex determination (**18**). In 1907 Correns postulated two kinds of male gametes, one determining the male and the other determining the female (**2**). In one well-known type of sex determination (XY), found in *Drosophila* and most of the mammals so far studied, the males have a pair of unlike sex chromo-

somes (XY) and the females a pair of like-sex chromosomes (XX). In another type (WZ), common in birds, the female has the pair of unlike sex chromosomes and the male the like pair. Among the *Hymenoptera* (bees, wasps, ants), a few of the *Homoptera* (white flies, scale insects), and a few other species of insects a still different type of sex determination is found. The males have only half as many chromosomes (haploid) as the females (diploid). For example, the drone of the honey bee has 16 whereas the workers and the queens have 32 chromosomes. This results from the fact that the queen does not release sperm upon all of the eggs as they are laid. Those not fertilized develop parthenogenetically into males and have only the chromosomes of the unfertilized egg; the fertilized eggs develop into females in which the chromosomes of both sperm and egg are summated.

To say that different genes residing only in the sex chromosomes have full responsibility for the initiation of development which eventuates in diverse primary and secondary sexual behavior between the sexes within a species and between them in closely and distantly related species would be incorrect. Yet it is quite in keeping with the available evidence to credit them with primary leadership in the instigation of this process. This is a first step in accounting for ontogenesis of one large group of instinctive responses. How far it may be extended in explaining phylogenesis of the same remains to be determined.

b. Sex differentiation: What control genes may exercise beyond the initial differentiation is largely conjectural at the present time. It is known, however, that the differentiation of primary and secondary sexual instincts in vertebrates is always preceded by the appearance of chemical substances from the endocrine glands. These are operative in developmental processes that produce the adult sexual activities, such as unlearned vocalizations and postural lures that attract males and females to each other during the "mating" season; fighting by males for exclusive control of females during certain phases of the reproductive cycle; copulation; serial acts having to do with laying and incubating eggs or with parturition; nidification; hiding, feeding, and defending of offspring, and age of onset, periodicity, and time of waning of many of these instinctive activities. From the fact that quite diverse behavior patterns are produced by the same substances in different races or species it is inferred that there is some degree of genic regulation of both production and utilization of the endocrine substances.

In the honey bee still different extrinsic factors contribute to differentiation during the developmental period. The workers and queens are alike as to their chromosomal make-up. A female embryo may become a worker or a queen. Which way it develops depends on how it is reared. Those becoming workers are kept in small cells and fed upon pollen from the third day of embryonal life; those becoming queens are reared in large cells and fed on royal jelly throughout the embryonal period. While we await the time when experimental embryologists can delineate the precise manner in which the extrinsic factors affect differentiation, we have the satisfaction of knowing that diversification is limited to a short period of embryonal and early adult life. Moreover, the problem to be solved falls in with those of morphogenesis for which a few promising methods of attack are now available. Again we must remind ourselves, however, that we are concerned here with ontogenesis rather than phylogenesis and that there is no guarantee that elucidation of the first will clarify the second.

c. Autosomal instincts: Although our data on autosomal inheritance of unlearned behavior are less abundant and exact than those relating to sex, they indicate that gene complexes serve as instigators and regulators of variation. The whirling tendency in mice is a recessive Mendelian character based on developmental defects of the inner ear. It is not associated with any lethal factor and is neither sex-linked nor linked with the factors for agouti, albinism, pink-eye, dilution, brown, Dutch spotting, short-ear, or kinky-tail (10). Pacing as a mode of locomotion arises spontaneously as a mutation in dogs, horses, and other quadrupeds. When pure-line trotting and pacing horses are hybridized, it behaves as a recessive unit character. It is now apparent that the basis of wildness and savageness in rats is inherited in gene-controlled patterns. According to Keeler (16) most of the tame strains of albinos employed in American laboratories bear the black gene or the black and piebald genes combined, the coat-color effects of which are masked by the albino gene. These tame strains appeared in our time as mutants from the wild Norway stock. Some of the hunting responses of dogs are transmitted as hereditary characters although the relationships are still somewhat obscure. Fighting and non-fighting mice have been subjected to extensive genetic analyses with results that leave no doubt as to their being transmitted as hereditary characters, despite the fact that they are easily masked by experience.

When appropriate methods of selection and isolation are applied to the foregoing hereditary variations, and still others not mentioned, many kinds and degrees of diversity may be produced.

Selection: Natural and Sexual

Without selection, variation would count for nothing in the production of notable diversity in instinctive activities. Conversely, selection is impotent without hereditary variations on which to work. These ideas had become apparent to Darwin following his voyage on the Beagle. Upon his return he began to assemble evidence, from all available sources, to support a plausible account of the selective mechanisms in nature whereby notable diversity could have developed as a necessary consequence of the struggle for survival through successive additions of behavioral adaptations.

He assumed that *Nature* selects animals in the feral state as practical breeders or fanciers choose those under domestication, but always without transcendental guidance or orthodirectional plan. From variations continually occurring in every direction (as a result of mutations and chromosomal changes, one now adds) nature selects those which *fortuitously* have adaptive value to their possessors which gives them an advantage over those not possessing equivalent variations. Sexual selection is only a special type of natural selection. Insofar as it pertains to instinctive behavior, it purports to account for only one or two classes of aggressive instincts and a few classes of preferential responses pertaining to mateships.

To what extent natural selection can account for the original hereditary adaptive behavior is still controversial. The question cannot be settled one way or the other by weight of the evidence now available. We know that in the case of dichotomies like pacing and trotting or whirling and non-whirling little more is accomplished after pure lines have been established, beyond strengthening the vigor or frequency of manifestation. In onset of puberty in hens, mice, rats, swine, and many other animals notable reductions have been made, although practical limits are finally reached because somatic maturity can no longer be coordinated with behavioral maturity. Also, selection has eradicated broodiness in certain races of domestic hens, a gain which, when coupled with early maturity and winter laying, has enormous economic worth to the poultry industry. Furthermore, relatively tame races of rats have been developed side by side with parent stock which is no

tamer than that living in the wild state. Mutations among rats at the Wistar Institute clearly suggest a plausible explanation of the "wild dogs" of Cuba which, as an obsession, overrun the books of Darwin. Even relevant statements can be made on the transmission of hereditary characters among the "neuter" insects, troublesome cases for Darwin and his followers. Yet despite considerable thought and planning to this end no evolutionist or practical breeder has ever contrived a simple scheme for intruding upon the "mating" flight of the honey bee, *Apis mellifica*, with a view to eliminating it entirely. The bee industry could well afford to offer a million dollars to the man who first produces a colony of honey bees that will mate in the laboratory as do the geneticists' special, *Drosophila melanogaster*.

Isolating Mechanisms

The necessity of isolation in early stages of diversification was perceived by all of the early evolutionists, but it was not well developed as a topic in evolutionary theory before the time of Lamarck and Charles Darwin. Isolation became a controversial topic during the second half of the nineteenth century but finally the consensus of opinion as to its importance stabilized at a point not essentially different from that expressed by Darwin in 1859. It is now apparent that isolating devices were no less instrumental in affording conditions for diversification of instincts than of somatic characters.

Among fundamental researches devoted to isolation are those dealing with psychological incompatibilities which prevent or minimize the crossing of races or interfertile species, thereby masking or eradicating small gains in diversification. Instincts which are presumed to be the product of isolation in turn become most effective isolating mechanisms themselves. Instances are numerous and, time permitting, would be most interesting to consider.

As a final word, and without pausing to summarize the points I have elected to stress in this brief survey of a century of progress, may I express extreme gratitude to the well-nigh innumerable biologists who, unmindful of "academic" criticisms of instinct, have continued to undertake fundamental research on the topic. Questions of origin and evolution have given them a common theme, a harmonizing principle for diverse undertakings. Biologists are now laying foundations for unparalleled expansion in a

hitherto unemphasized phase of animal psychology, one that is not revolutionary but highly useful: namely, the field of

Behavioral Ecology

Animal psychologists have neglected the study and appraisal of this important topic. Therefore, I can think of no better attitude with which to indoctrinate our colleagues of tomorrow who would make animal psychology their specialty than one of constant vigilance for opportunities to study the instincts as they are related to the subject of behavioral ecology.

BIBLIOGRAPHY

1. Allen, E., Danforth, C. A., & Doisey, E. A. Sex and internal secretions. Baltimore: Williams & Wilkins, 1939.
2. Correns, C. Die Bestimmung und Vererbung des Geschlechts. Berlin: 1907.
3. Darbishire, A. D. Note on the results of crossing Japanese waltzing mice with European albino races. *Biometrika*, 1902–1903, **2**, 1st rept., 101–104; 2nd rept., 165–174; 3rd rept., 282–285.
4. Darwin, Charles. On the origin of species. London: John Murray, 1859.
5. Darwin, Charles. Animals and plants under domestication. II. (2nd ed., rev.) New York: D. Appleton & Co., 1890.
6. Darwin, Francis. Life and letters of Charles Darwin. I. New York: D. Appleton & Co., 1891.
7. Darwin, Francis. The foundations of the Origin of Species. Cambridge: University Press, 1909.
8. Dobzhansky, T. Genetics and the Origin of Species (2nd ed.) New York: Columbia University Press, 1941.
9. Ewart, J. C. The Penycuik experiments. London: Adam & Charles Black, 1899.
10. Gates, W. H. The Japanese waltzing mouse: its origin, heredity, and relation to the genetic characters of other varieties of mice. Part III. Carnegie Instn. Washington Publ. No. 337, 1926, 83–138.
11. Galton, Francis. Experiments in pangenesis, etc. *Proc. Roy. Soc.* (London) 1871, **19**, 393–410.
12. Galton, Francis. A theory of heredity. *The Contemporary Rev.*, 1875, **27**, 80–95.
13. Heap, Walter. Preliminary note on the transplantation and growth of mammalian ova within a uterine foster-mother. *Proc. Royal Soc.* (London), 1890, **48**, 457–458.
14. Hurst, C. C. Experiments in genetics. Cambridge: University Press, 1925.
15. James, Wm. Principles of psychology. II. New York: Henry Holt & Co., 1890.
16. Keeler, C. E. Personal communication.
17. Lamarck, J. B. Philosophie zoologique. I. (Rev. Ed.) Paris: C. Martins, 1873.
18. MacClung, C. E. The accessory chromosome—sex determinant? *Biol. Bull.*, 1902, **3**, 43–84.
19. McDougall, Wm. Second report on a Lamarckian experiment. *Brit. J. Psychol.*, 1930, **20**, 201–218.

SEASON OF BIRTH AND MENTAL DIFFERENCES

BY R. PINTNER AND G. FORLANO
Teachers College, Columbia University

Whether the season of birth has any influence physically or mentally upon the individual is a question that has been raised by many research workers. The physical differences between children born in different seasons have been studied by numerous workers and most of these studies up to 1934 have been admirably described and summarized by Sanders (**19**). Weight at birth is the measure most frequently reported and, after a careful scrutiny of the data presented by about 20 studies, Sanders concludes that there is some increase in birth size of children born in late summer and fall, but that it can hardly be considered significant. It is not the purpose of this review, however, to duplicate the work of Sanders or to attempt a complete presentation of later reports on physical factors, but rather to refer to such only to the extent that they may throw some light upon mental differences related to season of birth.

Blonsky (**1**) in 1929 seems to have been the first to use results from mental tests. With only 453 cases of backward children he noted the fact that the highest mean IQ occurred in spring. The difference between the means for spring and the other seasons was not great, but he seemed to feel that he had obtained a finding of some eugenic significance. Very skeptical of such a result, Pintner (**13**) gathered 4925 cases and found differences in mean IQ between the seasons that approached statistical reliability. He emphasized the relatively low IQ occurring in winter. Also, and independently, stimulated by Blonsky's report, Looft (**10**) in Norway published results on feebleminded and backward cases.

Summary of Results

From these beginnings there have sprung about a dozen different reports dealing with this general problem, culminating recently in the monograph by Fitt (**4**). Table I gives a summary of eleven of these studies in chronological order. It will be noted that the studies vary greatly in the number of cases used, from only 337 by Looft to about 22,000 by Fitt. In most cases children have been used, but there are two reports for college students and one report for adult men. The present reviewers have arranged the lowest and the highest means by seasons in the last four col-

TABLE I

SUMMARY OF STUDIES USING INTELLIGENCE TESTS

Author	*Date*	*Cases*	*Lowest*		*Highest*	
			Season	*Mean Intelligence*	*Season*	*Mean Intelligence*
Blonsky (1)	1929	453 backward children	Autumn	81.3	Spring	84.3
			Winter	81.3		
Pintner (13)	1931	4,925 school children	Winter	95.9	Spring	97.2
					Summer	97.2
Pintner & Forlano (15)	1933	17,502 school children	Winter	100.65	Spring	102.3
Looft (10)	1934	337 (IQ's 85 to 100)	Summer	90.3	Spring	91.3
					Autumn	91.3
Pintner & Maller (17)	1937	6,353 school children	Winter	94.5	Autumn	96.5
Fialkin & Beckman (3)	1938	3,189 adult men	Winter	6.53*	Spring	6.69*
Pintner & Forlano (16)	1939	2,907 children in southern hemisphere	Winter	101.5	Spring	102.8
			Autumn	101.5		
		8,985 low IQ's	Winter	64.96	Spring	65.5
		658 institutional f.m.	Winter	52.2	Spring	53.2
MacMeeken (11)	1939	874 school children	Spring	99.4	Summer	101.2
Held (8)	1940	2,327 university students	Winter	49.3†	Summer	50.4†
Forlano & Ehrlich (5)	1941	7,897 college students	Autumn	211.8**	Spring	214.3**
			Winter	211.8**		
Fitt (4)	1941	22,356 children ages 10, 11, 12	Autumn	100.77	Summer	102.27

* Sigma units.
† Percentile.
** Score.

umns. In all cases these means refer to IQ's unless otherwise specified; *e.g.*, the results for the college students and adult men are not in terms of IQ. All of the data are from the northern hemisphere, except those of Fitt which were obtained in New Zealand, and some of the Pintner and Forlano data which came from the southern hemisphere. Of the data in the northern hemisphere, Russia, Norway and Scotland are represented, but the bulk of the results comes from the United States.

The year is divided into four seasons, but there is no definite universal convention as to when each season begins. Perhaps the most common custom is to regard spring as including March, April and May; summer is June, July and August; and so on. This division is indicated in both British and American dictionaries. But the dictionaries also refer to the equinoxes and solstices as marking the beginnings of the various seasons, so that spring would begin about the twenty-first of March and the predominantly spring months would be April, May and June; summer would include July, August and September; and so on. Some of our investigators have used these divisions in their studies. To make matters still more complicated, Fitt uses still another dividing line for the seasons. According to Fitt, the month in which the equinox, or solstice, occurs marks the middle month of each season, so that spring includes February, March and April; summer includes May, June and July; and so on. Fitt uses these "seasons" because they coincide with the varying amounts of solar light shed upon the earth; *i.e.* the most during summer (May, June, July) and the least during winter (November, December, January). Fitt reports all his results in terms of months of conception in order to conform to his hypothesis, which will be discussed later. In Table I, however, the present writers have transformed his results into birth months and have adopted the common custom in regard to the seasons. All data from the southern hemisphere have been translated into the equivalent months or seasons for the northern hemisphere.

With regard to the number of cases given by Fitt, it should be stated that 22,356 is the total number tested by him and includes four age groups, namely ages 10, 11, 12, 13. In Table I the results for the three most adequately sampled ages, namely 10, 11, 12, are given. It is not possible from the data presented by Fitt to tell exactly how many cases are actually involved, but presumably these three ages account for more than three-quarters of the cases;

i.e. probably between 18 and 20 thousand. We have, however, calculated the mean IQ per season for all the 22,356 and obtain the same highest and lowest seasonal means. Autumn is lowest with a mean of 100.3 and summer highest with a mean of 100.63. The difference between these two means is therefore less than that which appears in Table I.

A comment must be made on the MacMeeken report (11). The 874 cases consist of four roughly equal samples of children born on the first of February, first of May, first of August and first of November. Spring and summer in our table, therefore, refer to May and August births, and not to cases spread over the whole season. Rusk (**18**) reports briefly on this Scottish survey described in detail by Macmeeken. He gives the mean IQ for the February cases as 96.6, whereas Macmeeken reports this as 99.6. We have assumed that the Rusk figure is a typographical error. If it is not it would change the season in the table from spring to winter and fall more in line with the rest of the data.

Looking now at the two columns showing the seasons of lowest and highest means, we note that winter is predominant in the one and spring and summer in the other. For the lowest seasonal mean, winter occurs 10 times, autumn 4 times, spring and summer once each. The low summer mean is associated with a study of only 337 cases, the lowest number of cases reported by any of the workers mentioned. The low spring mean occurs in the Scottish study, where the number of cases was not very large, but they were carefully chosen, because they included all children born on a given day in a given year. Apart from these two discrepancies, winter and autumn, the cold and dark months of the year, predominate in showing the lowest means.

With regard to the seasons showing the highest means the general picture is equally clear. Spring occurs 9 times, summer 4 times, autumn only twice and winter not at all. One of the autumn occurrences comes again from the report having the fewest number of cases, but the other comes from a careful report with a considerable number of cases.

Fitt (**4**) gives the average IQ's for each month from four studies. Using his table (Table 36) and computing averages for the conventional seasons, one obtains the lowest IQ for winter, 98.03; then spring, 98.80; then autumn, 99.23; and the highest for summer, 99.47.

There seems, therefore, to emerge from all these studies a

strong suggestion of a slightly lower mean intelligence among individuals born in the winter-autumn half of the year, the colder-darker months, as compared with a slightly higher mean intelligence for individuals born in the spring-summer half of the year, the warmer-lighter months. This difference is very slight and in many cases where the author has reported the statistical significance of his data, it is well below the conventional limits, but in some cases it is also well above. However, whether the differences are statistically significant or not, the general picture presented by the data of Table I clearly indicates some universal trend. It is not a picture such as mere chance differences in seasonal IQ would present. These results come from many different investigators in many different countries and include individuals of very divergent ages.

A brief report by Chenoweth and Canning (**2**) shows a curve of the psychological scores of 489 students by month of birth. As they give no table of actual monthly means, their data could not be incorporated in our table. From the curve it would seem as if the lowest mean scores occur for the summer months and the highest scores for December through April. These findings are directly contrary to the general findings so far reported, but the number of cases is very small, no actual figures are given, and it is difficult to tell how the curves were constructed.

Another article by Mills (**12**) dealing with both physical and mental development as influenced by season uses college matriculation as an index of mental development and thus does not lend itself to inclusion in our table. Mills believes that the differences are due to the season when conception takes place. "Winter conception," he writes, "provides a significant advantage along lines of mental achievement," due to the "higher metabolic level of parental protoplasmic vigor" at that season of the year. His data consist of information regarding 45,000 college freshmen in various colleges. Calculating the deviations from normal expectancy of matriculation according to conception month, he finds the highest expectancy to occur in the autumn-winter season and the lowest in the spring-summer season. Turning his conception months into birth months, we note that the lowest expectancy occurs in the winter season, and therefore in so far as college matriculation is an index of mental development, we find that Mills' results agree roughtly with the general findings of intelligence tests.

Only one study, that of Forlano and Ehrlich (**5**), has gone be-

yond standard intelligence tests to include the results from objective personality tests. The tests used gave a measure of introversion-extraversion and a measure of feelings of inadequacy. Persons born in autumn and winter seemed to be more extraverted, while those in spring and summer were slightly more introverted. Those born in the summer also showed more feelings of inferiority. These are merely suggestions of possible trends, and the authors of the study warn against drawing any conclusions until more data are at hand.

Suggested Explanations

Many of the authors make certain hypotheses to explain these seasonal trends. Some do not. They merely present their data, calculate the statistical significance of the differences, and, finding this to be very low, dismiss the matter as due to chance. The hypotheses may be divided into two types, exogenous and endogenous. The exogenous theories seek to find some explanation in such physical factors as temperature, sunshine, etc., or in the health or vitality of the mother or child, or in the differential birth rate of different groups of people at different seasons of the year. The endogenous theories seek an explanation in seasonal changes within the organism more or less independent of external conditions.

Exogenous Theories

Blonsky (**1**) mentions the importance of sunlight, among other factors, for the health of the child during the first few months of life. Looft (**10**) also points out the importance of sunlight and mentions the relation between rachitic diseases and sunlight. Pintner and Forlano (**15**) present curves showing the correspondence between monthly changes in temperature and amount of sunshine and monthly differences in IQ. They also report a rank correlation of +.59 between mean monthly IQ and amount of sunshine, and a rank correlation of +.67 between monthly IQ and mean monthly temperature.

The general health or vitality of the individual is likely to be better in summer than in winter. The winter-born children are weaned in summer, says Blonsky (**1**), and this presents peculiar dangers for them. Pintner and Maller (**17**) and Pintner and Forlano (**15**) present data to show the higher mortality rates in winter for people in general, for infants during the first year of life and for infants during the first month of life (neo-natal mortality). Pintner and Forlano (**15**) comment on the generally accepted be-

lief in the higher morbidity rates for the winter months, and from these findings with reference to mortality and morbidity present a tentative hypothesis. They say, "Children born in winter who survive are more likely to be impaired. Children born in winter suffer more illness and are born of mothers weighted with more illness." Fitt argues against this hypothesis, pointing out that the higher mortality rates for children born in winter would probably eliminate relatively more lower IQ's and therefore the mean IQ for the winter months should increase rather than decrease. He does not, however, take into account the factor of greater morbidity during the winter months among those who survive.

The importance of the age at beginning school is mentioned by Blonsky, who says that the spring-born children have the advantage here in that they are a month or so older in beginning school. The argument here is not clear. No other worker has published any evidence in this connection, although probably many have thought of it. In all probability it would be difficult to find any relationship between month of birth and age at beginning school, particularly so in many areas where great latitude as to age at beginning school exists and also where children may begin their schooling in September or in February. Furthermore is it advantageous to begin school a little older as Blonsky suggests, or a little younger? And lastly, such trivial differences would hardly have influences stretching into adolescence and adulthood.

Seasonal differences in birth rates of three different ethnic groups; namely, Italian, Jewish and Negro, have been studied by Pintner and Maller (17). Although they found some seasonal differences in birth rates, they also found the curves for average monthly IQ's to be similar for all three groups. Goodenough (6, 7) believes that the seasonal fluctuations in IQ can be explained by the selective planning of births by the more intelligent parents. Dividing her cases into six occupational levels, she finds in the three highest levels more births occurring in spring and summer, whereas in the three lowest levels the number of births is distributed among the four seasons in accordance with chance expectancy. If this conscious selective planning of births to occur at a favorable season of the year is actually taking place in this country as Goodenough believes, then it would seem that American mothers had anticipated Blonsky's advice to Soviet mothers to see to it that their children should be born in the most favorable season of the year. In addition to her own data, Goodenough also uses the Pintner

and Forlano data (**15**) to show that in their highest social level the fewest number of births occurred in winter, whereas in the medium and low social levels no such differentiation was apparent. When all three levels are combined, the lowest mean IQ occurs in winter, but this cannot be due to selective planning in the highest social level, because the lowest mean IQ occurs in winter at each social level taken separately. The lowest mean IQ occurs in winter in the lowest social level, where selective planning of births has been ruled out by the hypothesis and by the number of births per season.

Endogenous Theories

Two writers, presumably independently of each other, have proposed endogenous theories somewhat similar in nature. Huntington (**9**) in this country described his theory at great length in a book published in 1938. Fitt (**4**) in New Zealand published his theory in 1941. He makes no reference to the Huntington book and presumably had no access to it at the time he was writing. As we have noted above, Mills (**12**) also believes seasonal differences are caused by endogenous factors at the time of conception.

Huntington believes there is a basic animal rhythm causing the greater number of births to occur in early spring (February, March, April). "Births of persons of unusual genius," he says, "conform to the animal rhythm and to the temperature much more closely than do births in general." He presents many curves of the birth months of eminent individuals and concludes, "the facts thus far before us suggest that persons of unusual mental ability show a stronger tendency than others to be born in winter."

This conclusion of Huntington does not agree with the study by Pintner and Forlano (**14**) of the birth month of eminent men. The criterion of eminence used was inclusion in *Who's Who in America* or *American Men of Science* or Plarr's *Men and Women of the Time.* Pintner and Forlano conclude, "Our data do not show any reliable differences between months or seasons with reference to the birthdays of eminent men. There is little consistency in the trend from sample to sample. The highest percentage may fall in any season or any month." Furthermore, Huntington's conclusion does not fit into the general findings with reference to IQ and season of birth. The most stable finding of the many studies we have already reviewed is the fact of the slightly lower IQ of individuals born in the winter months. We realize of course that high IQ and eminence are

not the same thing, although one would expect a high correlation between the two. Huntington's theory of a basic animal rhythm responsible for an optimum season of birth is not invalidated by the findings we have mentioned. The theory may still be tenable, but he may not have chosen the correct optimum season. The data from intelligence tests would suggest that the optimum season may be summer or spring and the worst season winter.

Somewhat similar to Huntington's theory is the one recently propounded by Fitt (**4**). He also suggests that there is an internal seasonal biological rhythm. It may be an endocrine rhythm. It is analogous to the process of hibernation occurring in many animal species. This means for the human organism that the autumn-winter period is the period of minimal stress, and the spring-summer half of the year the period of maximum stress. Therefore, argues Fitt, the best period for conception is the period of minimal stress; *i.e.*, the autumn-winter period. We may note here the similarity of this theory to the "higher metabolic level" during winter as suggested by Mills (**12**). Fitt uses the month in which the equinox or solstice occurs as the mid-month of each season, hence his autumn-winter period of minimal stress is from August to January inclusive. Conceptions during these months would result in births during May to October, and in general this is the period showing the highest mean IQ. The spring-summer period of maximum stress would extend from February to July inclusive and conceptions during these months would result in births during November to April. This period of the year coincides roughly with the winter season where most investigators find the lowest mean IQ.

Fitt's hypothesis of an internal biological rhythm seems to fit the data from intelligence tests much better than Huntington's theory of the basic animal rhythm. In support of his hypothesis, Fitt also presents data from learning tests, seasonal fluctuations in increases in height and weight, and seasonal trends in mortality, morbidity, delinquency, and so forth. A discussion of these factors would take us far beyond the scope of the present review. It is, however, appropriate to mention that Fitt is the first writer in this field who has suggested possible practical educational implications that might follow from all this work on the basis of his hypothesis. Since the autumn-winter period (August to January) is the period of minimal biological stress, it is, he argues, the best period for mental work. We should, therefore, adjust our educational year so

that it ends with its final examinations in December or January, that is, ending with the period when the organism is at its optimum for mental work. The shift to new classes and new courses would begin in January or February. The usual summer vacation in the middle of this readjusted academic year would be an advantage in that it would be a pause for recuperation before the final half of the academic year, that is the period of optimum mental work. These practical applications are ingenious and suggestive, but it seems to the present writers that the hypothesis of a basic biological rhythm will have to be far more firmly established before it would be wise to attempt to carry them into effect. However, it remains to Fitt's credit that he has attempted to bring the data with reference to IQ and season of birth into line with the findings as to seasonal fluctuations in many other fields, and his hypothesis will have to be reckoned with in all future work.

Conclusion

In this review we have traced the studies relating to intelligence and season of birth from their beginning in 1929 to the present day. The problem seemed at first ridiculous and inconsequential. As study after study appeared, the fact of differential seasonal trends became more apparent, the subjects studied became more numerous and included older people as well as school children, the authors sought in various directions for possible reasons until finally we have arrived at attempts to envisage these seasonal trends in IQ as merely one aspect of the seasonal fluctuations of numerous physical, mental and sociological factors. Future work will be directed to more complete samples of whole age groups tested by means of all kinds of psychological tests, not merely intelligence tests, and a more rigorous checking of the various exogenous and endogenous hypotheses that have been proposed.

Bibliography

1. Blonsky, P. P. Früh- und Spätjahrkinder. Jb. Kinderheilk., 1929, **124**, 115–120.
2. Chenoweth, L. B., & Canning, R. G. Relation of season of birth to certain attributes of students. *Hum. biol.*, 1941, **13**, 533–540.
3. Fialkin, H. N., & Beckman, R. O. The influence of month of birth on the intelligence test scores of adults. *J. genet. Psychol.*, 1938, **52**, 203–209.
4. Fitt, A. B. Seasonal influence on growth function and inheritance. *Educ. Res. Series, No. 17.* New Zealand Council for Educ. Res., 1941.

5. FORLANO, G., & EHRLICH, V. Z. Month and season of birth in relation to intelligence, introversion-extraversion, and inferiority feelings. *J. educ. Psychol.*, 1941, **32**, 1–12.
6. GOODENOUGH, F. L. Intelligence and month of birth. *Psychol. Bull.*, 1940, **37**, 442.
7. GOODENOUGH, F. L. Month of birth as related to socio-economic status of parents. *J. genet. Psychol.*, 1941, **59**, 65–76.
8. HELD, O. C. Influence of month of birth on intelligence of college freshmen. *J. genet. Psychol.*, 1940, **57**, 211–217.
9. HUNTINGTON, E. Season of birth. New York: Wiley & Sons, 1938.
10. LOOFT, C. Les enfants printaniers et les enfants d'automne, leur évolution d'intelligence. *Acta paediatr.*, Stockh., 1934, **15**, 381–395.
11. MACMEEKEN, A. M. The intelligence of a representative group of Scottish children. London: London University Press, 1939.
12. MILLS, C. A. Mental and physical development as influenced by season of conception. *Hum. biol.*, 1941, **13**, 378–389.
13. PINTNER, R. Intelligence and month of birth. *J. appl. Psychol.*, 1931, **15**, 149–154.
14. PINTNER, R., & FORLANO, G. The birth month of eminent men. *J. appl. Psychol.*, 1934, **18**, 178–188.
15. PINTNER, R., & FORLANO, G. The influence of month of birth on intelligence quotients. *J. educ. Psychol.*, 1933, **24**, 561–584.
16. PINTNER, R., & FORLANO, G. Season of birth and intelligence. *J. genet. Psychol.*, 1939, **54**, 353–358.
17. PINTNER, R., & MALLER, J. B. Month of birth and average intelligence among different ethnic groups. *J. genet. Psychol.*, 1937, **50**, 91–107.
18. RUSK, R. R. The intelligence of Scottish children. 39th yearb. Natl. Soc. Stud. Educ., 1940. Part II, chap. 18, 269–273.
19. SANDERS, B. S. Environment and growth. Baltimore: Warwick & York, 1934.

PSYCHOLOGY AND THE WAR

Edited by

STEUART HENDERSON BRITT

CONTENTS

TRAINING IN MILITARY PERSONNEL PSYCHOLOGY: MINIMUM REQUIREMENTS FOR COLLEGE COURSES

BY ROGER M. BELLOWS
The Adjutant General's Office
AND
MARION W. RICHARDSON
The Adjutant General's Office

I

During the next year many future Army officers will take training in personnel work in university departments of psychology throughout the country. Familiarity with assets and liabilities of workers now performing technical and consultant duties of personnel officers, both in uniform and in civilian professional status, suggests that it is desirable for these departments of psychology to consider several requirements for training military personnel psychologists.

Suggested minimum essentials for college military personnel training programs are submitted here chiefly for the guidance of heads of departments and others who will plan the courses. It is hoped that civilian instructors who develop and present the courses will profit from the military orientation and the source materials that are presented on the following pages, and that the eventual military value of students who take such courses will be increased.

The necessity for training military psychologists has been treated in an article by Pennington and Chase (**8**), who support their statement by reference to four previous publications in which this need has been emphasized. Their suggested course in military psychology does not, however, stress needed specific academic courses in military personnel psychology. The course in military psychology being offered at the University of Illinois includes the following: introduction, leadership and discipline, morale and motivation, perceptual problems, efficiency of military personnel, military placement, and personality adjustment. The topic of efficiency of military personnel is allotted 4 class hours of the total of 28 class hours. This topic embraces effects of fatigue on mental and muscular work, control of fatigue, and relation of environmental factors to fatigue. Five class hours out of a total of 28 class hours are devoted to military placement, which comprises tech-

niques useful in selection, determination of effectiveness in placement, interpretation of test results, and morale, discipline and effective placement.

It is thought that, in this general introductory course, somewhat more emphasis could be placed on psychology of military personnel work since the majority of military psychologists* now serve in Induction Stations, Reception Centers, and Replacement Training Centers and have full-time duties concerned with programs of personnel selection, classification and assignment, or closely related problems including test construction, administration, analysis of Army jobs, and personnel records.

II

What do military personnel psychologists do on these jobs? A classification officer who is trained in military personnel psychology usually has the specific duties of either Personnel Technician or Personnel Consultant. The classification officer is responsible for accomplishing the objectives of the Army personnel classification system in the installation to which he is assigned. Most personnel officers work at Reception Centers or Replacement Training Centers although some are employed by armies, army corps, divisions, oversea departments, defense commands, and service commands.

According to Army regulation (**13**), a Personnel Technician is a classification officer who is charged with the administration of classification procedure and policies, and a Personnel Consultant is a classification officer who counsels or supervises action on matters involving psychological principles and practices. Qualifications of Personnel Technicians include technical training and experience in personnel administration. Personnel Consultants must have sufficient academic background of a psychological nature to insure the necessary general insight into psychological problems of military personnel.

The duties of a Personnel Technician include initiating the Soldier's Qualification Card for all unclassified enlisted men; testing all enlisted men with the Army General Classification Test and

* It should be noted here that courses in experimental and in physiological psychology are basic to those few military psychologists who are working on special problems of perception, including night driving and flying, and related problems which are not primarily concerned with the classification of military personnel.

other tests developed or approved for this purpose by The Adjutant General's Office; and initiating a system whereby the Soldier's Qualification Card and other classification data are kept up to date. A Personnel Technician must also be familiar with existing memoranda and headquarters directives on classification; must coordinate classification procedures employed in the various subordinate units to establish and maintain uniform procedure; consult with other Personnel Technicians; submit information to the commander of the unit pertaining to the functions of classification, reclassification, assignment and reassignment of soldiers; inaugurate and conduct conferences on classification procedures; and conduct schools for Army commissioned and enlisted personnel who are to aid in operating the classification system.

The duties of the Personnel Consultant are similar to those of the Personnel Technician. His duties may be somewhat more supervisory than those of the Personnel Technician inasmuch as he is charged with the responsibility of inspection and supervision of all phases of psychological work being undertaken in a unit; recommending assignment of personnel within the unit; coordinating the personnel program; supervising the administration, scoring and interpreting all group tests; and providing consultant services on all psychological problems pertaining to classification of military personnel including conferences and consultations with the general and special staff officers. He may assist the Personnel Technician in the conduct of military school courses on classification; may administer special tests and interviews to personnel requiring individual attention; and he may act as expert witness or adviser in conection with special boards and courts.

The assets of officers and technicians now consist mainly of their training in traditional courses offered in the fields of applied psychology. Their liabilities, the weak spots in the training of these military personnel workers, are caused largely by a lack of training in new subjects that are to be mentioned in section IV of this paper, as well as lack of needed emphasis on certain content in traditional courses listed in the following paragraphs.

III

The following list of courses contains chiefly the familiar course-titles which are to be found in most university catalogs. It should be noted that both content and emphasis stress practical application and opportunity for practice. It is assumed that departments

of psychology at present are offering these courses in applied psychology:

1. Tests and measurements: Survey of the most common general intelligence, aptitude and achievement tests; observation and practice in test administration; interpretation of test data for individual diagnosis and group appraisal; actual practice in construction of aptitude and achievement tests; elements of test evaluation.

2. Personnel psychology: General problems of personnel selection including use of interview, or letters of application and letters of recommendation, tests, and personal data records; psychological aspects of personnel management; morale and the employee interview as an aid in improvement of management-worker relations.

3. Industrial psychology: Production measurement; job analysis; techniques of motion and time analysis; relations of physical working environment to production; problems of monotony and fatigue; accident prevention and control.

4. Clinical psychology: Clinical methods, including individual tests for diagnosis; remedial techniques and procedures, with particular emphasis on special training, *e.g.* reading; actual observation and work with abnormal individuals who deviate to a large extent from the average.

5 Vocational orientation: Practice in test administration, counseling, interviews and test interpretation for appraising characteristics of the individual; interpretation of counseling data in terms of occupational requirements; practice in counseling individuals under supervision of instructor.

6. Educational psychology: Individual differences; principles and purposes of homogeneous grouping; methods of measuring outcomes of education and of interpreting related data; problems and principles of economy in learning; the elements of effective teaching.

7. Statistics: Methods of analyzing mass personnel data; methods of presenting and interpreting statistical indices with particular reference to data pertaining to evaluation of tests and personnel techniques; laboratory practice in computation, presentation, and interpretation of data; practice in developing and editing writeups and reports dealing with statistical findings.

Many courses in tests and measurements are superficial in the sense that they constitute merely a survey of existing test practices and very rarely include any content on fundamentals of test and measurement rationale. Students who have completed such courses therefore understand nothing of the fundamental logic of psychological measurement.

It will be evident to the reader who is familiar with Army training programs in classification that in the brief description of these courses, all offered to undergraduates or graduates in the larger departments, emphasis has been placed on that part of the content which will dovetail with the training eventually to be received by

student personnel officers and consultants in The Adjutant General's School (9), and with the duties of enlisted and officer military personnel workers. It will be noted by all that the emphasis has been toward the practical rather than the theoretical.

The following additional items of training may be suggested:

1. Occupations and occupational psychology.
2. Criterion development and appraisal.
3. Practicum in use of Army classification tools.

Occupational psychology. Courses in vocational guidance, student personnel work, and educational and occupational counseling overlap to some degree with the first item cited. These courses, however, are not aimed toward military personnel work, and do not completely satisfy the present requirements. They are useful but not sufficient. Courses in occupations must give a comprehensive view of the world of work with specific reference to knowledge of occupations having direct counterparts in military job specialties.

Courses in occupational psychology should include the psychological principles, methods, and results which may be applied to problems such as job analysis, interpretation of occupational information, and horizontal transfer of knowledge and skills from industry to military job specialties. These courses could well include a few weeks of intensive practice in the use of occupational tools developed by the Occupational Analysis Section of the United States Employment Service. Of these tools, the Dictionary of Occupational Titles is most widely used, Part I (3) of which gives concise definitions for 17,000 separate jobs. It contains 29,000 job titles of which 7,000 are coded and classified. Part II (4) of the Dictionary is a group arrangement of occupational titles and codes, and gives a comprehensive list of job titles classified according to their code; it constitutes the structure for classification of civilian occupations. Part III is least important for the present purpose, comprising a revision of certain occupational codes. Part IV (5) is designed to enable classification of inexperienced workers for on-the-job training on the basis of their potentialities rather than their job histories.

Although the history of occupational psychology dates back little more than a single decade, there is a sufficient body of knowledge to enable development of valuable semester courses of three to five hours, built around factual information available in the literature. Courses in occupational psychology should be co-

ordinated as closely as possible with local United States Employment Service Offices. Two such courses were developed at the Ohio State University by Harold A. Edgerton: Educational and Vocational Guidance Laboratory, and Laboratory in Employment Techniques. Close cooperation has been maintained with the local offices of the United States Employment Service. The training in employment techniques has emphasized participation and experience in guidance and counseling, supervised experience in employment interviewing, testing with work samples and group tests, classification and placement in the actual employment situation. Practice in the use of the Dictionary of Occupational Titles has been stressed as a basic part of the classification function.

Criterion development. Closely related and fundamental to the general field of occupational psychology are the special problems involved in criteria for worker efficiency. Few military personnel workers are sufficiently familiar with the necessity for, or methods used in, appraising performance of soldiers in their assignments. Since this problem of criterion development runs through the entire field of military personnel work—from techniques for test validation through transfer and promotion, to training problems—it is of primary importance.

In order to interpret and evaluate Army Classification Test data, it is standard practice to take into account validity of the tests employed. But the conventional textbook definition of validity is not too helpful. Validity indices must be interpreted in terms of the fallibility of the criterion used in evaluating the test. They must not be viewed from the traditional standpoint based on the arbitrary thesis that criteria are infallible. Evaluation of performance of soldiers and officers with a view to promotion and reassignment is an important function of classification officers. A number of sources of checking value of job criteria, and methods for checking degree of contamination have been considered by one of the present writers (1).

It is urged that the student be given the opportunity to work with actual data, to grapple with problems of test-criterion relations in his local situation, and to use item analyses against criteria. His eventual value as a military personnel psychologist will be greatly increased if he has "soiled his hands" with real data that are inevitably contaminated to some degree by influence of selection, subjectivity, and chance error.

Army classification tools. Practice in use of actual Army clas-

sification tools should comprise one of the minimum requirements for academic training of future military personnel psychologists. Of these tools the Soldier's Qualification Card* seems most important for practice use in the academic situation. According to Bott (2), in reference to record systems developed by psychologists in the Royal Air Force, there are three features essential to military personnel records: continuity, accessibility, and comparability. The Soldier's Qualification Card is routed from station to station with the soldier, so that it accompanies him from Reception Center to Replacement Training Center to school to combat unit, and is designed to give a continuous record that will be accessible and will contain data on the same items for all soldiers so that individuals may be compared with groups. Study of the function of the Soldier's Qualification Card articulated with practice in its use would give students a more comprehensive view of classification as it is actually conducted, and at the same time they would gain facility in the use of the basic Army techniques of interviewing, recording, and interpretation of data.

In the case of colleges and universities that have ROTC units this practical training in Army classification procedures could be given by conducting a classification program for the local ROTC Corps.** Another minimum requirement would seem to be close contact with classification officers in nearby military installations. A number of other classification officers are stationed at induction, reception and replacement centers, and a few are located in other units. Program arrangements for visiting these military classification locations, and for the military Personnel Technicians and Personnel Consultants to visit and discuss methods and problems with students on the campus, would result in a kind of liaison that would yield useful results.

IV

Sources of occupational and military personnel information, accessible to civilians and to psychology departments for instructional purposes, would include certain War Department Army

* This is War Department, The Adjutant General's Office, Form No. 20. Its description and use are given in an Army Regulation (11) pertaining to initial classification of enlisted men. It is also described in the special wartime issue of Occupations (10).

** This practical method of training was suggested by Captain Sidney Adams, Headquarters, Army Air Forces Technical Training Command.

Regulations and Training Manuals. Of these, the most essential are:

Army Regulations 615–25, July 31, 1942 (**11**)

This pertains to general aspects of recruit sorting and classification, testing and interviewing techniques employed, keeping soldiers' qualification records, and assignment of men to military duties.

Army Regulations 615–26, September 15, 1942 (**12**)

Section I of this document pertains to potentialities and abilities which the soldier brings with him to the Reception Center of the Army. This section sets forth the procedures used by military personnel psychologists designed for maximum utilization of these potentialities in classification.

In Section II the Army jobs are listed and defined. It shows how the Army can use the civilian training and experience that each man has had. For each Army job there is a listing of the civilian jobs that are related to it, or are civilian counterparts of it.

Section III is devoted to the problem of maximum utilization of men who are illiterate, who do not speak English, or who measure up very poorly on general intelligence tests.

Army Regulation 615–28, May 28, 1942 (**13**)

This includes general considerations of classification in Reception Centers and Replacement Training Centers and in divisions and separate military units. It also considers duties of Personnel Technicians and Personnel Consultants.

Army Regulations 605–90, May 21, 1942 (**14**)

Problems peculiar to Officer and Warrant Officer classification are treated. Procedures are specified for interviewing and testing, recording data on the officers and warrant officers qualification card (W.D., AGO Form No. 66-1), for officer assignment, reassignment, and for maintaining personnel records and related personnel functions.

Technical Manual—Test Manual (in press) (**15**)

This gives general information on statistical analysis of test data, describes approved classification tests in general terms, and includes specific information on interpretation of test results as needed by personnel workers who classify enlisted men.

V

Those who will select and classify men for the Armed Forces and industrial workers for the war effort, and who will during the longer period of demobilization lead in the reclassification, adjustment, and return of many millions to civil occupations, will perform their duties more effectively if they receive appropriate preinduction training. They must receive training in college personnel courses which will equip them to learn to cope with current problems basic in the application of psychology to military personnel work.

Especially pertinent to the needs of the Army is the request

that graduates of civilian courses in personnel psychology not be led to believe that this training will enable them to serve as Army personnel psychologists. They will realize that they " . . . will not be regarded as experts but as novices who must still serve an apprenticeship before the real value of their training can be apparent" (6).

Bibliography

1. Bellows, R. M. Procedures for evaluating vocational criteria. *J. appl Psychol.*, 1941, **25**, 499–513.
2. Bott, E. A. Report on personnel selection in Royal Air Force and Royal Canadian Air Force. National Research Council of Canada. (Mimeographed) November, 1941 (now classified as confidential).
3. Dictionary of Occupational Titles: Part I. U. S. Employment Service, 1939. U. S. Govt. Printing Office, Washington, D. C.
4. Dictionary of Occupational Titles: Part II. U. S. Employment Service, 1939. U. S. Govt. Printing Office, Washington, D. C.
5. Dictionary of Occupational Titles: Part IV. U. S. Employment Service, 1941. U. S. Govt. Printing Office, Washington, D. C.
6. Jenkins, J. G. A departmental program in psychotechnology. *J. consult Psychol.*, 1939, **3**, 54–56.
7. Masincup, W. E. A new tool for interviewers: Dictionary of Occupational Titles: Part IV. *Employ. Secur. Rev.*, 1942, 6–8.
8. Pennington, L. A., & Chase, H. W. A course in military psychology. *Psychol. Bull.*, 1942, **39**, 377–380.
9. Seidenfeld, M. A. The Adjutant General's School and the training of psychological personnel for the Army. *Psychol. Bull.*, 1942, **39**, 381–384.
10. Vocational Guidance for Victory. Chapter 4, How the Army Classifies its Personnel, in *Occupations*, 1942, **21**, 17–33.
11. War Department, The Adjutant General's Office, Army Regulations 615–625, July 31, 1942. U. S. Govt. Printing Office, Washington, D. C.
12. War Department, The Adjutant General's Office, Army Regulations 615–626, September 15, 1942. U. S. Govt. Printing Office, Washington, D. C.
13. War Department, The Adjutant General's Office, Army Regulations 615–628, May 28, 1942. U. S. Govt. Printing Office, Washington, D. C.
14. War Department, The Adjutant General's Office, Army Regulations 605–690, May 21, 1942. U. S. Govt. Printing Office, Washington, D. C.
15. War Department, The Adjutant General's Office, Technical Manual: Test Manual. *In Press.* U. S. Govt. Printing Office, Washington, D. C.

THE SUBCOMMITTEE ON MENTAL DEFICIENCY

BY EDGAR A. DOLL
Vineland Training School

The formation of a Subcommittee on Mental Deficiency was voted by the Emergency Committee in Psychology at its meeting in May, 1941. The preliminaries to this action are of some interest as a record of developments.

In August, 1940, the present Chairman of the Subcommittee endeavored to promote the appointment of a committee on mental deficiency within the framework of the National Research Council. Such action seemed needed because of (a) the generally evident confusion in academic circles on the concept and methods of determining mental deficiency, and reflected in the controversial discussion of the effect of environmental stimulation; and (b) anticipation of more widespread and more effective consideration of problems of mental deficiency in relation to the growing national emergency with special reference to military problems and the civilian support of military enterprises. In respect to the former issue, it was recognized that the significance of mental deficiency had not been exploited in its scientific ramifications in the fields of anthropology, education, and the social and medical sciences, but had rather been viewed as merely practical problems in the field of social welfare administration and of special education. Confusion also existed as to the role of psychology in relation to medical science, particularly psychiatry, and in the detection of mental deficiency and its administrative disposition. The merits of academic controversy were confused by differences in orientation and concept, and the results of scientific inquiry were misleading because of scientific misunderstanding. It seemed as if many of these issues could be clarified by an authoritative body within the National Research Council.

With regard to the imminent problems of national welfare, both in the armed forces and in civilian life, the question of mental deficiency assumes an enlarged practical significance. It seemed advisable to anticipate these problems which *a priori* included: (a) the avoidance of inducting mental defectives into the armed forces; (b) the safeguarding of industrial production; (c) improvement in the occupational placement of mental defectives for greater social usefulness; (d) protection of mental defectives from the conse-

quences of social readjustments; (e) provision of optimum means for detecting mental defectives with reference to these considerations. It also seemed advisable to capitalize on the military and social experience with mental defectives incurred during the last war.

While efforts were being made to provide for these purposes within the National Research Council, the Emergency Committee in Psychology was established. In collaboration with the personnel of this committee, notably Robert A. Brotemarkle, assistance was rendered to the Personnel Procedures Section of the Adjutant General's Office relative to the selection and placement of mental defectives. The weaknesses of conceiving mental deficiency as a degree of intelligence below 11 years suggested the advisability of expanding this criterion so as to include social, educational, and occupational evidence, with particular reference to the capacity for adjustment and learning in military situations.

Consideration was also given to the specific problems of placement, training, and supervision, with special emphasis on the occupational usefulness of mental defectives in military service. At the same time correlative action was promoted within the American Association on Mental Deficiency designed to clarify the useful role of mental defectives in industrial and civil life, as well as to evolve the hazards of unrecognized mental deficiency with a view to obviating these dangers. The general outcome of these considerations was incorporated in the presidential address to the American Association for Applied Psychology at its September, 1941, meeting (1). This address, entitled "Scientific Freedom," was devoted to an over-all plan of utilization of psychological resources as illustrated from the field of mental deficiency.

Events led to the formulation of proposals to the Emergency Committee in Psychology regarding the importance of the issues and ways of meeting them. After considering the merits of this proposal, the Emergency Committee voted to establish a Subcommittee on Mental Deficiency with the responsibility for representing the interests of psychology in these matters. The following members of the Subcommittee were appointed: Florentine Hackbush, H. Meltzer, George Ordahl, Rudolf Pintner, Mary Vanuxem, and Edgar A. Doll (Chairman). The Subcommittee has the advantage of being represented by its Chairman on similar committees of four related national societies, namely, the American Association on Mental Deficiency, the American Orthopsychiatric

Association, the International Council of Exceptional Children, and the American Association for Applied Psychology. The program and accomplishments of the Subcommittee may be briefly summarized in outline form:

1. *Concept.* The Subcommittee considers its first duty to clarify the concept of mental deficiency with special reference to its practical bearing on both military and civil life. A syllabus has been prepared but not yet promulgated formulating this concept in terms of both history and status with reference to social competence, educational attainment, occupational proficiency, and intellectual level. This formulation is concerned chiefly with high-grade male adult defectives and pays some attention to etiological form because of the practical bearing of endogenous and exogenous causation on social adaptation. It remains to obtain general professional endorsement of this formulation, and to encourage its widespread use.

2. *Screening methods.* Supplementing this concept, the Subcommittee has been concerned with ways and means of substantiating it through both screening devices and the more elaborate process of extended clinical-psychological evaluation. To this end a tentative syllabus of rapid examination methods has been formulated. This has been supplemented by the preparation of an effective rapid interview designed to emphasize social aptitude or inaptitude for both military and civilian purposes. Some progress has been made in adapting the Vineland Social Maturity Scale for rapid separation of marginal deficiency from marginal normality, and particularly for the machine evaluation of personal interview data for the evaluation of social competence. Search has been made among the less familiar clinical and psychometric devices which give promise of speed and efficiency. Emphasis has also been laid on the basic importance of motor aptitude and coordination tests which are specifically relevant to military and industrial processes.

3. *Personnel.* An important project of the Subcommittee is the preparation of a specialized list of professional personnel experienced in specialties specifically relevant to mental deficiency. In collaboration with the Office of Psychological Personnel, preliminary lists have been prepared of psychologists who are experienced in the field of mental deficiency in such directions as teaching, research, and practice, and in such fields as welfare institutions, correctional institutions, welfare agencies, public schools, and indus-

try. The Subcommittee is also concerned with related professional specialties, particularly in the fields of education and social welfare.

4. *Coordination.* Recognizing the importance of collaborating with related professional agencies, the Subcommittee anticipates correlating its efforts with similar professional groups as well as with public institutions and agencies such as schools, clinics, and welfare bureaus. This includes the stimulation of collaboration with public institutions for the feeble-minded.

5. *Placement.* The Subcommittee hopes in time to extend its services in the direction of manpower utilization to such contacts as may be established with public and private agencies concerned, this to be accomplished as an advisory and promotional service to these agencies through the Emergency Committee. This includes specifically the preparation of occupational information designed primarily to facilitate the optimum usefulness of mental defectives in the armed forces, and secondarily in civilian life.

6. *Conduct problems.* As in the last war, there is already apparent a concentration of mentally defective women in camp areas and industrial areas, constituting a serious problem from the standpoint of health and morals. Preliminary work by one member of the Subcommittee clearly indicates the need for public action in this direction which, if effectively taken, will require an extension of psychological services to law enforcement agencies. A more immediate problem is the adequate disposition of military offenders who may be feeble-minded. Consulting advice on this problem has already been extended to one of our allies.

7. *Training.* Closely allied to the problem of placement is that of training designed to provide occupational readjustments or to increase effective utilization of occupational effort. Already military rehabilitation and special training centers have been established in which the problems of training and replacement of mental defectives have become acute. The importance of psychological service in this area is greatly increased by the present policy of not requiring mental defectives to be apt in all the fundamental duties of a soldier, but requiring rather that they be utilized as effectively as possible in some military capacity.

8. *Research.* The Subcommittee is concerned with promoting effective research of immediate value in the field of mental deficiency with special reference to military and civilian welfare. One such study about to be undertaken will be concerned with the present status of mental defectives discharged from public institutions

who have since been inducted into the armed forces or placed in production industries. It is impracticable here to enumerate the particular research projects which the Subcommittee would like to see pursued, but it is hoped that information will be received of special research studies completed, in progress, or contemplated.

9. *Post-war period.* It is anticipated that the efforts of this Subcommittee will be projected into the post-war period. Here the major problems will be such matters as the social readjustments of mental defectives discharged from the armed forces, or released from employment, or otherwise affected by the readjustments of peacetime. The ultimate outcome of the work of the Subcommittee may be the promotion of a sounder scientific orientation to the problems of mental deficiency, and a more effective utilization of psychologists in relation to the optimum social disposition of mental defectives in a total national economy.

Bibliography

1. Doll, E. A. Scientific freedom. *J. consult. Psychol.*, 1942. 6. 1–7.

THE SUBCOMMITTEE ON THE SERVICES OF WOMEN PSYCHOLOGISTS IN THE EMERGENCY

BY RUTH S. TOLMAN

Division of Program Surveys, U. S. Department of Agriculture

The Emergency Committee in Psychology recommended on November 29, 1941, that a subcommittee be appointed "to investigate the possible activities or services of women psychologists in the national emergency." The membership of the Subcommittee on the Services of Women Psychologists in the Emergency was established with a view to wide regional representation; the members are: Theodora M. Abel, Steuart Henderson Britt, Alice I. Bryan, Edna Heidbreder, C. M. Louttit, Bertha M. Luckey, Jean W. Macfarlane, Harriet E. O'Shea, Helen Peak, Ruth S. Tolman (Chairman). A meeting of this Subcommittee was held on January 10, 1942, and plans were discussed for more active participation of women psychologists in a situation which, since Pearl Harbor, was no longer an emergency but a total war. The various areas in which the psychological work of women could be utilized most helpfully were reviewed, plans were inaugurated for the assembling of information on work already under way, and special committees were appointed for the development of materials which would probably be useful in relation to war activities.

Two facts were important in the orientation of activities of the Subcommittee. The first was the realization that one responsibility for women psychologists necessarily would lead all others: the replacement of men in colleges and clinics. With large numbers of men entering the armed services, educational and clinical responsibilities will fall heavily upon women if psychological training is to be maintained and if problem children and defective children are to be cared for adequately. The second fact was the organization in December, 1941, of the National Council of Women Psychologists to function as an *action* organization through the development of local units, and to undertake community projects dictated by the needs of those communities. Accordingly, the present Subcommittee regarded its functions as fact-finding and advisory in nature, and various recommendations for action have been made to the National Council of Women Psychologists. Special recommendations have also been made to other women psychologists eager for participation in the war effort.

Preparation of materials. Among the projects carried out by members of the Subcommittee or at their instigation has been the development by Dr. Peak and Dr. Heidbreder of a series of tentative suggestions for undergraduate courses in psychology for women in the emergency (3). An outline and summary of materials on Training for Leadership in Civilian Life was prepared by Dr. Abel and Dr. Bryan, and copies have been distributed. Dr. Mary Shirley is preparing a review of the material on Children in War Time, covering the literature both in British and American journals.

Testing for Selective Service Local Boards. In Chicago, New York, San Francisco, Cincinnati, Washington, and other localities, many women psychologists participated with men psychologists in testing projects for Selective Service Local Boards until the time when other methods of selection were introduced. The Indiana Association of Clinical Psychologists also aided the Indiana State Medical Officer of Selective Service by compiling case studies and securing pertinent background data in doubtful cases which appeared before Local Boards.

Care of pre-school children. In Pittsburgh, Chicago, Cincinnati, and other places, women psychologists have carried heavy responsibilities in forming organizations for the mobilization of trained workers for the care of pre-school children. Dr. Elizabeth L. Woods, Dr. Dorothy W. Baruch, Dr. Mary Cover Jones, Dr. Mary Woods Bennett, and others are active in this program in California. In Cincinnati a program has been worked out by the Family-Child Welfare Committee of the Defense Council for the emergency care of children; and classes with laboratory work have been organized, with lectures by psychiatrists, psychologists, and other experts in the field of child development. Dr. Myra W. Kuenzel has been active in this program. Dr. Ruth Updegraff has served as Consultant to the National Commission for Young Children, which is composed of eleven specialists in psychological and social problems of children and which coöperates with Federal and State agencies throughout the country in organizing work for children in all states. Many women psychologists have participated in the opening of WPA nursery schools and in the training programs for volunteers in child care; they have also assisted in the preparation of brochures for parents on the handling of children in air raids and in other crises of war.

Selection of volunteer workers in civilian defense agencies. In

Cleveland, Milwaukee, New York, and other large cities, the help of psychologists has been welcomed in evaluating the services of volunteers and in selection and placement of workers. In Cleveland Dr. Luckey has played an active part in the development of such a program, organizing a group of psychologists to codify responses of volunteers and to evaluate the background and experience of the individual volunteer in order to determine his most useful assignment within the civilian defense organization.

Research in food habits. Dr. Margaret Mead submitted suggestions for research in the field of food habits which were circulated among members of the Subcommittee, and from time to time she has obtained their assistance in specific studies connected with problems of food shortages and proposed or actual rationing programs.

Occupational testing. Women psychologists in branches of the United States Employment Service are constantly devising and applying tests for various government agencies. Miss Barbara Anne Mayer and Dr. Phyllis Bartelme are two women psychologists engaged in this work on the west coast, and others are employed in Washington and in other branch offices.

Government Service. In the spring of 1941 at least 400 psychologists were employed in various branches of the Federal service (**1**). Of these, at least 10 per cent were women, and since then even more women psychologists have taken work in various government departments. Some women psychologists have joined the WAACS and the WAVES, either as officer candidates or as enlisted personnel, but the exact number is not known at this time.

Selection of WAAC Officer Candidates. During June, 1941, seven women psychologists served as representatives of Mrs. Oveta Culp Hobby on Interviewing Boards in the nine Service Commands throughout the country, assisting in the selection of Officer Candidates for the Women's Army Auxiliary Corps. This program has been previously described (**2**).

Other activities. A survey of activities of women psychologists in Texas, Louisiana, Mississippi, Alabama, Tennessee, Kentucky, Florida, Georgia, North Carolina, South Carolina, and Virginia has been carried out by Dr. Helen Peak, and a study of the professional work of women members of the Chicago Psychological Club by Dr. Helen M. Wolfle. Some of the services mentioned may be listed: adjusting college courses to meet the emergency; working with advisory committees of WPA nursery schools; serving on

National Committee on Volunteers for Young Children; assisting in special "morale" clinics; interviewing and classifying delinquents in the neighborhood of armed camps; lecturing on morale, child care, and mental hygiene; volunteer testing of nurses in training for army service.

Statements, written and oral. Since women everywhere are eager to be of service in connection with the war, certain groups have wished to hear specifically of the fields of psychology or the types of service to which women psychologists can direct their activities. Statements on this subject have been made at the Institute of Women's Professional Relations, and from time to time to groups of women undergraduate students in psychology at different colleges. A written statement, mentioning fields in which women psychologists were able to serve, was incorporated in the Proceedings of the Tolan Committee during a hearing dealing with the subject of women in war defense production. Women psychologists have been urged to register with the National Roster of Scientific and Specialized Personnel; and many special inquiries have been referred to the Office of Psychological Personnel, National Research Council.

Bibliography

1. Britt, S. H. Employment of psychologists in the Federal government. *Psychol. Bull.*, 1942, **39**, 255–257.
2. Goodenough, F. L. The selection of candidates for the Officer Candidate School at the Women's Army Auxiliary Corps Training Center. *Psychol. Bull.*, 1942, **39**, 634–637.
3. Tolman, R. S. Tentative suggestions on undergraduate psychological training for women in the emergency. *Psychol. Bull.*, 1942, **39**, 406–407.

THE SUBCOMMITTEE ON LEARNING AND TRAINING

BY M. R. TRABUE
Pennsylvania State College

The popular saying, "What you don't know doesn't hurt you," is probably less true in war than in peace. Parents and friends are usually far more disturbed by lack of any information than they would be by the full truth regarding absent soldiers and sailors. In a similar manner it is possible that some psychologists imagine that they are being "left out" of many extremely important and dramatic developments in their science, when as a matter of fact many of the activities of special committees of psychologists are far more routine and tedious than dramatic. An account of some of the activities of the Subcommittee on Learning and Training may, therefore, be of general interest to psychologists and serve as an antidote to the fear that something startling is going on behind closed doors. The membership of this Subcommittee is: Frank N. Freeman, Richard W. Husband, Fred S. Keller, Arthur W. Melton, Edward K. Strong, Jr., and M. R. Trabue (Chairman).

The Subcommittee has explored a large number of problems. One of the first of these, brought to the attention of the Chairman soon after the Subcommittee was organized in April, 1941, was that of the selection and training of women for occupations in defense industries. It was a relatively simple matter to discover that the United States Employment Service, through its Occupational Analysis Section, was already developing much more complete information in this field than any other organization or committee could possibly assemble without an extremely large appropriation and staff. A few months later this contact with the United States Employment Service was also recommended to Dr. Ruth S. Tolman when she was appointed Chairman of the Subcommittee on Services of Women Psychologists in the Emergency.

Another problem brought to the attention of the present Subcommittee was that of discovering suitable activities for school children to engage in during air raids. The Chairman worked with various school authorities in developing effective programs.

During the summer of 1941 the attention of the Subcommittee was drawn to a report that had been prepared in 1918 by two

psychologists at Camp Lewis describing a study in measuring and improving the coördinations of recruits in learning to use the army rifle. This experiment had made use of apparatus commonly found in psychology laboratories of that period, and had made it possible to improve the training process through synchronized objective records of breathing, trigger squeeze, and other coördinations. This report was brought to the attention of the proper military authorities in Washington.

The Subcommittee has also been concerned with demonstrations of the possibility of re-educating the visual habits of young men who have lost some of their skills in binocular vision. This matter was brought to the attention of the Chairman by a well-known clinical authority in the field of reading and vision.

One of the problems faced by every company commander in a modern army is the selection and assignment of men to give instruction in the routine operation of machines and equipment. This problem was presented to the members of the Educational Section of the American Association for Applied Psychology by means of a mimeographed letter in which suggested solutions were invited. The Subcommittee now faces the problem of getting practical aids organized and made available to soldiers who have instructional responsibilities thrown upon them. Another problem presented to the Educational Section of the AAAP was that of developing some skills of leadership in college boys, so that they would be more adequately prepared for service in the armed forces. Perhaps a booklet or magazine article will ultimately serve as a summary of the suggestions.

The correspondence carried on by the Subcommittee has been fairly extensive in volume and variety. Many correspondents are seeking guidance in their efforts to serve their country more effectively, and some are seeking subsidies for the conduct of further research on some psychological idea or device.

The most successful activity undertaken by the Subcommittee on Learning and Training grew out of a report which had come to the Emergency Committee on Psychology before the Subcommittee was organized, stating that many would-be airplane pilots were failing to receive "wings" because they were unable to master the international Morse code. The Chairman of the Subcommittee collected information from the War and Navy Departments regarding procedures that were being used in the instruction of recruits in the use of the code, and reviewed experiments that had

been carried on by the Signal Corps under the auspices of the National Research Council immediately after the previous war as well as studies by numerous civilians in more recent years.

Dr. Fred S. Keller of Columbia University, a member of the Subcommittee, had been an expert telegrapher previous to becoming a psychologist, and he readily agreed to explore the problem further, to analyze the experimental evidence available, and to plan improved teaching procedures that would be sound psychologically and sufficiently simple to be used in camps throughout the country. He made personal contacts with many different types of schools teaching the code, including the Signal Corps School at Fort Monmouth, New Jersey. On the basis of this experience and information, Dr. Keller developed new instructional procedures, and with the help of the Psychology Department at Columbia University, set up some experimental classes among the students of his own institution. Dr. Keller was also aided substantially by Dr. Spaulding Rogers of Hofstra College, Mr. Robert E. Taubman, a graduate student at Columbia University, and Professor Richard P. Youtz of Barnard College. These experimental classes made unusually satisfactory progress, making it appear probable that the amount of time being used in code practice by Army and Navy men was much greater than would be necessary if the improved procedures should be adopted.

Dr. Keller actually gave up his summer teaching position and salary, assembled his instructional materials, and went to the Signal Corps Replacement Training Center at Fort Monmouth, where he secured permission to demonstrate the new procedures. The conditions under which the demonstration began were most unsatisfactory. Adequate data on progress in code learning under the old procedures were, and still are, lacking; and control groups have thus far been impossible to obtain; but in a few weeks the progress of the experimental classes was so much greater than that of the others that Keller's method of instruction was adopted for exclusive use at this Training Center. Although it appears that the psychologically planned instructional procedures require considerably less time than the older official methods of instruction, it has been impossible to obtain scientific data on the difference, due to the fact that the Signal Corps instructors have not been willing to continue to use the older method since the newer one has become available. It is good to know, however, that the method is being adopted in other places throughout the country.

THE SUBCOMMITTEE ON A TEXTBOOK OF MILITARY PSYCHOLOGY

BY EDWIN G. BORING
Harvard University

America needs a textbook on military psychology. Pioneer work in this field was done in the United States in 1917–18, and American psychologists have advanced the knowledge of military applications of psychology to an extent far beyond that reached by any of our enemies. Paradoxically enough, the results of American research and observation in military psychology are available in the American literature only in fragmentary form. The Germans dignify military psychology and teach it formally, but the American students and Army and Navy officer-candidates are likely to gain such knowledge only by fortunate accident or through contact with a psychologist familiar with the field.

Yet only a few psychologists have direct knowledge of military problems and the ways in which psychological findings aid in their solution. With millions of American men taking up arms, how are enough of their leaders to know about the psychological tools at their disposal? And how can the officers and the more thoughtful enlisted men be put in possession of the psychological point of view toward the great human war machine? In this most mechanized of all wars, no machine exists in such great numbers, nor requires such expert servicing, as the human machine. None is so precious. And for no other is functioning at peak efficiency so vital to the winning of the war. It is for these reasons that the Emergency Committee in Psychology of the National Research Council is directing the writing of a text on military psychology.

The Army has always needed such a weapon. As long ago as August, 1917, the War Department's Committee on Education and Special Training suggested to Major Robert M. Yerkes, then Chairman of the National Research Council's Committee on Psychology, that a suitable course in psychology with special reference to its military bearings should be prepared for use in the Students' Army Training Corps. A subcommittee was appointed then and an outline prepared for these three courses (**1**, **3**):

I. The Study of Human Action
II. Educational Psychology
III. The Psychology of Reasoning

The writing of a text for the first of these courses was begun, and the first six chapters were published in this *Bulletin* under the general title, *Outlines of the Study of Human Action* (2):

1. The Conditions of Human Action. By Raymond Dodge.
2. Individual Differences. By E. L. Thorndike.
3. Tests of General Intelligence. By L. M. Terman.
4. The Use of Intelligence Tests in the Army. By L. M. Terman.
5. How the Army Uses Individual Differences. By members of the Committee on the Classification of Personnel in the Army. (There were sections on Trade Tests, Development Battalions, and The Rating Scale.)
6. The Obtaining of Information: Psychology of Observation and Report. By G. M. Whipple.
7. The Learning Process. By E. K. Strong.
8. Morale in War and After. By G. Stanley Hall.

Although the outline also called for a chapter on the Principles of Leadership by E. H. Lindley, it was never published. The Armistice in November, 1918, terminated the project.

In the present war the project was discussed again in meetings of the National Research Council's Emergency Committee in Psychology. There was at first some doubt as to the practicability of the undertaking, as to whether a handbook or a textbook was wanted, as to whether the content was actually available. Then Harvard's Department of Psychology undertook to demonstrate the feasibility of the project by preparing outlines. Dr. Gordon W. Allport supervised the "dynamic" part, the present writer the perceptual part. The outlines were sent to the Emergency Committee, which considered the matter in May, 1942, and then established the Subcommittee on a Textbook of Military Psychology. The members of this Subcommittee are: Edwin G. Boring, editor-in-chief and chairman; Herbert S. Langfeld, editor on perceptual functions; Walter V. Bingham, editor on training, efficiency and selection; Gordon W. Allport, editor on motivation, morale, and personal adjustments; Edwin R. Guthrie, editor on leadership, public opinion, and psychological warfare; Col. E. R. Munson, Jr., of the Information Division of the War Department, military and editorial consultant; and Marjorie Van de Water, of Science Service, general writer, editor and Washington representative of the editor-in-chief.

The four editors reorganized their parts of the original outline and undertook to write some sections themselves, but for the most part "farmed out" chapters and sections to those expert collabora-

tors who could write a first draft of what was wanted. Forty-five psychologists have already contributed. The editors are responsible for collating the contributions of their respective sections of the book, while responsibility for synthesis and rewriting devolves on Miss Van de Water and the editor-in-chief. All these collaborators and editors are contributing their time, without expectation of remuneration; royalties, if any, will go to the National Research Council.

Of the fifteen chapters originally projected, first drafts of all but two were already completed on December 1, 1942. Some chapters not originally planned have been added, and work on collating is progressing. Some chapters are receiving advance publication in the *Infantry Journal*.

The following list indicates the subject matter that is being included. These are not chapter headings.

Human nature and combat	Personal adjustment in warfare
Sight as a military tool	Leadership
Hearing as a military tool	National and group differences
Smell and equilibration	Crowd behavior
Training	Rumor
Efficiency	Public opinion
Classification and assignment	Propaganda
Motivation and morale	Psychological warfare

In the rewriting, the style is determined by the audience selected. It is written for the soldier, the soldier who will read a book. Only that of immediate interest and usefulness to a man in the armed services is being retained. Material important to psychologists but of exclusively professional interest has to be set aside for possible use in later, academic editions if there is demand for them. An attempt is being made to keep the text vigorous, alive, practical, interesting, and free from any obvious parade of academic learning.

The book will be published with the imprimature of the National Research Council. General acknowledgment to collaborators and editors will be made if it does not seem inappropriate, but no specific assignment of credits and responsibilities will be possible. In general, there are no chapter authors. One chapter that began with a single author now has seven, and might still have more. It is hoped that a small book, in clear format on good yet inexpensive paper, with stiff paper covers—a book that might

sell for even as little as twenty-five cents—can be achieved. The proposed title is: "Psychology for the Fighting Soldier."

BIBLIOGRAPHY

1. DODGE, R. Courses in psychology for the Students' Army Training Corps. *Psychol. Bull.*, 1918, **15**, 129–135.
2. *Psychol. Bull.*, 1918, **15**, 137–167, 177–206, 217–248, 328–242, 361–426.
3. YERKES, R. M. Report of the Psychology Committee of the National Research Council. *Psychol. Rev.*, 1919, **26**, 83–149, esp. 136–138.

THE SUBCOMMITTEE ON PSYCHOLOGICAL ASPECTS OF READJUSTMENT*

BY HAROLD E. BURTT
Ohio State University

The Subcommittee on Psychological Aspects of Readjustment consists of: Dean Frank N. Freeman, School of Education, University of California, Berkeley; Dr. Douglas H. Fryer, New York University, University Heights, New York; Dr. Charles S. Berry, Bureau of Special and Adult Education, Ohio State University, Columbus, Ohio; Dr. Harold A. Edgerton, Director, Occupational Opportunities Service, Ohio State University, Columbus, Ohio; and Dr. Harold E. Burtt (Chairman), Department of Psychology, Ohio State University, Columbus, Ohio.

The Subcommittee is addressing itself to various problems that will arise in the period immediately following the war. It is not concerned with extensive social planning of the post-war years. The immediate problems at the time of demobilization will involve two groups: (1) persons in apparently normal condition who must be adjusted back to civilian life; (2) persons who have had some physical or mental trauma and whose readjustment may be more difficult and may involve rehabilitation work.

The program, in process of organization by the Subcommittee, will necessitate coöperation with other agencies in its actual execution. The Committee is working on some of the more obvious problems at the present time, and is preparing plans, materials, and techniques.

* Because the work of this Subcommittee is in a planning stage, this report is purposely brief.

MORALE RESEARCH AND ITS CLEARING

BY GORDON W. ALLPORT
AND
GERTRUDE R. SCHMEIDLER
Harvard University

As long ago as November, 1940, the need for a central clearing-house to aid social psychologists in making their maximum contribution in the national emergency was foreseen. At that time a Washington conference of twenty-five psychologists was called by the National Research Council to consider "psychological factors in morale." This conference recommended in its report that such a clearing-house be established. Although various foundations were approached, no financial help was offered. Hence, instead of an adequately staffed and financially supported clearing-house, only volunteer service has been available to help steer the voluminous traffic.

Some may say that since social psychology nowadays is directly represented in governmental agencies, the problem solves itself. But the opposite is true. It is because of the increased psychological activity of governmental agencies that the work of psychologists remaining in colleges and universities becomes increasingly important. Not only are they potential collaborators of their Washington colleagues, but also potential contributors to all manner of local and national morale-building efforts conducted by private organizations. The problem then is to assist hundreds of nongovernmental social psychologists to find useful work to do, to put them in touch with those in the government or outside it who are most interested in the same problems, and to help them place the results of their work to best advantage.

In late November, 1941, following a conference with R. C. Tryon on some problems encountered by the Office of the Coordinator of Information, the Emergency Committee in Psychology of the National Research Council established a Subcommittee on Defense Seminars. The function of the Subcommittee was to stimulate, coordinate, and clear research in social psychology in different colleges and universities, through the organization of seminars which should carry on investigations useful to the government. The National Research Council appointed the following members to this Subcommittee: R. C. Tryon, F. H. Sanford, and

G. W. Allport (Chairman). Later G. R. Schmeidler assisted with the work.

Since there was no financial support for this service, it was necessarily conducted on a small and inadequate scale. Twenty-five contacts with psychological centers of research were initially made, of which twenty-three resulted in promises of cooperation. The following institutions participated: University of California (two groups), University of California at Los Angeles, University of Chicago, College of the City of New York (two groups), University of Colorado, Cornell University, Dartmouth College, George Washington University, Harvard University, University of Iowa, University of Minnesota, Northwestern University, Ohio State University, Rutgers University, Psychologists Club of San Francisco Bay Region, Sarah Lawrence College, University of Southern California, Syracuse University, Stanford University, and Yale University.

It soon became clear, however, that the activities of the Subcommittee could not be confined to contacts with these institutions. Too many psychologists in too many institutions wanted to help. Isolated individuals, undergraduate classes, local groups of various sorts became correspondents of the Subcommittee. Psychologists wanted to know how to establish Rumor Clinics, how to clear the findings of their local investigations of morale, where to place patriotic radio programs they had written—a thousand and one things—above all what they could do to help in the war effort. Meanwhile, government requests began to come from a great variety of agencies, of which the Office of the Coordinator of Information was only one. Help was requested in such diversified fields of service as the planning of public opinion studies, the interrogation of war prisoners, the analysis of rumor, the construction of morale-building courses, the analysis of foreign cultures.

At the same time, because of retrenchments within the universities and colleges, and because of the large number of psychologists leaving institutions of higher learning, the conduct of formal seminars grew more difficult. It rapidly became necessary to rely upon individual psychologists or upon informal groups to carry out the investigations. Before the autumn of 1942 it became clear that fully half of the most important work done by the Subcommittee had not been done through the formal seminar organization. Early in September, 1942, the Subcommittee recommended that it be discharged by the Emergency Committee, since the scope of its work did not in fact correspond to the initial conception of the Defense Seminars. This recommendation was accepted.

Looking backward for a moment to September, 1941, we find that at that time the Society for the Psychological Study of Social Issues had organized a Committee on Morale and Leadership Research. Alvin Zander, as acting chairman, was publishing a newsletter to members of the Committee to keep them informed of the work in progress. There was apparently some overlap in function between this group and the Subcommittee on Defense Seminars. Accordingly, following the discharge of the latter group in September, 1942, the SPSSI reorganized and extended its own work, naming G. W. Allport Chairman of a Committee on War Service and Research. The present Subcommittees are:

Clearance and Information (G. R. Schmeidler)
Leadership Research (Kurt Lewin)
Morale Research (Eric Wright)
News Letter on Morale and Leadership Research (Alvin Zander)
Field Cooperation (H. B. English)
Morale Measurement (A. R. Gilliland)
Children in Wartime (L. B. Murphy)

It should be reported also that a separate, important Committee of SPSSI is concerned with Psychological Considerations in Making the Peace, with Gardner Murphy as Chairman.

The variety of the requests received by the Subcommittee on Defense Seminars during its brief life, and of the requests now coming in to the reorganized office (operating now under the auspices of the SPSSI) is evidence of the need for some central way-station. The purpose of such an office, let it be said, is not to "coordinate" social psychology in any mechanical sense, but to provide some of the large amount of clearing and information service that seems unavoidable and necessary. It should be emphasized, however, that a great deal of the most commendable work is being done by psychologists who remain completely decentralized and merge their efforts altogether with those of local community agencies.

In an entirely new area of investigation, such as the psychology of wartime morale, definitions and boundaries are hard to establish. We list here some of the topics which our files show to be most commonly engaging the attention of social psychologists today. Taken together these topics seem to define the field of social psychology in wartime:

Assessing the state of morale in specific localities.
Information polls: public awareness of facts and issues.
Trend studies in public opinion.

Personality correlates of high and low morale.
Background factors in morale.
Attitudes toward nationality groups.
Fears of students in relation to the war.
Attitudes and reactions of children toward the war.
Care of children in air raids.
Panic prevention.
Case studies of individuals with low or high morale.
Current acceptance of traditional ideology.
Changes in personal ethics as a result of new conditions.
Attitudes of occupational groups toward economic problems.
Responses to priorities and rationing.
Factors affecting industrial morale.
Personnel methods in defense plants.
Work methods in defense plants.
Social and vocational rehabilitation of the unemployed.
War and postwar requirements for professional personnel.
Tests for leadership.
Methods of officer selection.
Special problems of military morale.
Optimal methods of presenting American ideas and goals.
Preparation of lectures on morale.
Analysis and execution of propaganda campaigns.
Preparation of propaganda leaflets and broadcasts.
Slogans: their popularity and efficacy.
Collection and analysis of rumors.
Rumor Clinics and other preventive measures.
"Listening posts": analysis of overheard conversations.
Analysis of newspaper editorial policy.
Nature of Axis radio propaganda.
Nazi and Japanese ideology, especially *Wertheorie*.
National character of the French, Poles, Germans, Japanese, etc.
Characteristics of minority groups in America.
Problems in race prejudice.
Studies in the nature and prevention of scapegoating.
Surveys of public opinion on postwar plans.
Psychological considerations in making the peace.
Postwar reconstruction problems.
Essentials for normal living.
Changing food habits.

PSYCHOLOGY AND THE WAR: NOTES

Occupational Bulletin No. 23 on Educational Services was issued by the National Headquarters of the Selective Service System on September 30, 1942. Although the listing of psychology was considered by responsible officials in various agencies concerned with the problem of critical occupations, psychology was not included in the final list. Although additional factual materials have since been prepared, it is difficult to predict the eventual results.

POFFENBERGER, A. T. Principles of applied psychology. New York: Appleton-Century Company, 1942. Pp. xvi+655.

The author's contribution to this field dates back to 1917 when he collaborated with Hollingworth in a book on this same topic. At that time it was essentially a pioneer effort. In 1927 Poffenberger assumed the sole responsibility for a revision. In the intervening period there had been marked advances in applied psychology,—many of them brought about by the first World War. In the years between that revision and the present one, there has been less progress in applied psychology as far as basic principles are concerned. Psychology has been applied by more people and in more places but progress has been rather in the extension of existing principles than in the discovery of a large number of new ones. Thus no radical change in the book was to be anticipated and none is found. The main differences are the inclusion of more up-to-date illustrative material, some readjustment of emphasis, the condensation of some of the introductory chapters and the inclusion of new chapters on radio and the jury. The emphasis throughout is on individual adjustment; in fact this is almost a key-note for the book.

The first chapters are somewhat preliminary dealing with race, age, sex, learning, and thinking. The chapter on learning is especially good and would be a credit to any psychology text. However, the content of these chapters should be largely familiar to the student with an introductory course in psychology. If the text is intended for this level, these chapters could be omitted without great loss and more time devoted to the topics discussed toward the end of the book.

Turning then to the industrial field, we have a consideration of work, rest and accidents, with rather brief emphasis on the last of these. The laboratory literature on noise is covered quite thoroughly and considerable effort made to reconcile contradictory results. There is an adequate treatment of the psychological aspects of illumination. Some new work on the effects of high altitude is mentioned. The author is wisely cautious about weather and climate. The chapter on monotony is especially good. The discussion of drugs is conventional but a good summary, and includes recent work with benzedrine. Next we have problems of vocational adjustment. The reviewer's only criticism here is the inadequate discussion of the employment interview which comprises only two pages although in actual practice it plays a very large role. The following chapter on opinion and judgment which are often used in evaluating people for vocational purposes, treats the sources of error quite extensively. In fact, the treatment is almost too thorough for a book at this particular level. The main points in rating scale techniques are discussed, followed by intelligence and special ability tests. The author prefers the term "character" where most of us refer to "personality" and elaborates this distinction. The chapter, however, handles this difficult topic effectively. The discussion of interests might well include a little more emphasis on Strong's interest inventory which is so widely used in practical situations.

We then turn to the effects of industrial specialization and standardi-

zation upon the individual. This entails considerable discussion of laboratory experiments on changing the type of work, mental set, perseveration. Some readers will dislike the inclusion of so much laboratory material at the expense of actual field work. Then follows a chapter on incentives which concludes with an excellent half-page summary of factors which make incentives effective. The chapter on reducing the cost of work subsumes under this heading many aspects of industrial efficiency such as economy of movement, methods of carrying loads, rest pauses. That is one of the best chapters in this portion of the book.

The chapter on "satisfaction" is the nearest approach to a specific discussion of morale which we find in the book. It is handled well except for inadequate treatment of the measurement of satisfaction or morale. For some reason the author avoids the term "morale" and does not even include it in the index. This seems unfortunate in view of the current widespread interest in the topic.

The discussion of advertising and selling is briefer than that of the preceding aspects of business psychology. There is a good concise chapter on distribution centering largely around wants and desires. Another chapter covers the usual ground in the psychology of advertising very briefly but effectively. A separate chapter is devoted to radio and discusses at some length the question of eye *vs* ear.

The book up to this point comprises twenty-seven chapters and the remaining eight are devoted to legal, criminal, medical and educational aspects of psychology. The first of these deals with the causes of crime and steers a middle course on the question of low intelligence as a factor in delinquency. There is passing mention of delusions, differences in inhibition, weather, drugs, suggestion from press and movies. This chapter covers a lot of ground in a hurry. The chapter on the witness touches upon illusions, errors of judgment, difficulties in memory. As to methods of crime detection the Association Test is stressed. There is a single paragraph on breathing and another on blood pressure. The reviewer believes that these topics should receive more emphasis, particularly in view of the fact that many officials (some of them inadequately trained) are using such procedures in practical work. At least it would be well to sound a note of caution regarding the use of these techniques by incompetent persons.

Experiments on jury procedure and differences in sentencing tendencies of judges are presented in some detail. As to treatment of the offender the emphasis is on the deterrent effect of punishment and the possibilities of re-education on the basis of individual diagnosis.

Turning to the medical aspects, there is a somewhat unique chapter which analyzes the psychological aspects of preventive medicine, and leads up to the general notion that it is necessary to "sell" this idea. With reference to mental disease, stress is very properly laid on the exciting causes in many of our social institutions. The diagnosis of disease is discussed from the standpoint of the introspections of the ordinary patient and the various symptoms which are diagnostic of mental disorder. There is some emphasis on frustration, and a straight-forward presentation of psycho-analysis. The chapter on treatment lists a dozen kinds of therapy which are essentially psychological, stresses rapport, and concludes with

an interesting recommendation of a psychologist attached to the general hospital.

The final chapter deals with education. The author indicates "Nowhere are these principles so universally applicable" as in the field of education, and justifies the limitation of this topic to a single chapter of fourteen pages on the ground that "practically all the matters dealt with in the preceding chapters have a direct bearing upon the problems of education." He feels it is sufficient then merely to indicate the main direction of educational psychology. Some readers will disagree with this point of view. However, he does high-light the important things such as the role of the individual as a unit in education, the possibilities of measurement of aptitudes and personality, the field of adult education, and the use of devices such as moving pictures and radio. He merely names a lot of the principles that have been discussed earlier and that fit into the learning aspect of education.

The aspect of the book that will be most seriously criticized is the relative emphasis on the different topics. Industrial efficiency, broadly construed, gets a more complete discussion than anything else. Education, as just implied, receives very little discussion in its own right. Medical and legal applications likewise receive comparatively scant treatment. However these briefer portions are nevertheless well done and the material is wisely selected. It would be impossible for any writer to cover the entire field of applied psychology and give a proportionate emphasis that would appeal to all readers,—or all reviewers.

The book seems to be aimed at the student with an introductory background in psychology. It is definitely not written down to the layman although the preface suggests that he can "read around" the more technical portions. For example, the author presents a correlation coefficient without any explanation of what it means and introduces factor analysis without any hint as to how it is done. On the other hand the author does introduce material, such as that on learning, that a student would have had in an elementary course.

There are numerous figures which are well selected and make the text more understandable. It is likewise very thoroughly annotated and will be of some value as a reference book. There is a bibliography of over 700 titles which will prove helpful to people running down the literature in this field.

On the whole, the book is comprehensive, well-written and readable. Aside from the matter of comparative emphasis the reviewer has no serious criticism. It will undoubtedly fill a useful place as a test book for courses on applied psychology.

HAROLD E. BURTT.

Ohio State University.

CRUZE, WENDELL W. Educational psychology. New York: Ronald Press, 1942. Pp. xvi+572.

The author explains that the preparation of this book was motivated by a long felt need, "for an elementary text for college courses in educational psychology that gives adequate emphasis to the practicality, as well

as other values, of the materials which it presents, that recognizes the unitary and developing nature of the student who peruses its pages, and that produces desirable changes in his behavior as well as his professional life." (iii) The point of view, depth of insight, content, and style of the volume are quite accurately indicated by this sentence.

The organization of the text is conventional and designed to focus attention upon the processes of growth, development, and learning. The style is simple, direct, and non-controversial, well suited to the needs of underclassmen who have not studied general psychology. Emphasis throughout is on a noncritical presentation of the more recent investigations of the traditional problems of educational psychology. The various theories of learning are given equally courteous and brief attention, the issues are not clarified: certainly there is no attempt at indoctrination.

In common with many texts in this field the book contains an abundance of material which can be memorized for examination purposes and a scarcity of material which can be understood in relation to the vital problems of education. After studying this book the student will know that W. F. Dearborn initiated *The Harvard Growth Study* but he will be surprised on testing his first class to find a range of eight years in reading ability. He will know that "homogeneous-grouping" represents another approach to the problem of individual differences but he will not know the extent to which trait differences nullifies such an approach. He will know the influence of marihuana, aspirin and fasting on learning but he will have no adequate set of principles to guide him in the organization of the pupil's learning experiences. He will know that the highest correlations between intelligence and achievement are obtained in the elementary school and the lowest at the college level but the only reason he will be able to give for this fact will be "that many variables other than intelligence influence academic achievement in college." (160).

Teachers of educational psychology who organize their courses around available experimental findings regardless of importance will like this text, those who organize their courses around the vital problems of the classroom teacher will not.

WALTER W. COOK.

University of Minnesota.

JORDAN, A. M. Educational psychology (3rd ed.): New York, Henry Holt and Co., 1942. Pp. xviii+597.

This book will stand favorable comparison with any textbook in its field. It is attractive in appearance, well organized, and interestingly written. This edition, like the two previous ones, is written in the best Teachers College tradition. It does not reflect any apparent consciousness of systematic position, although from a systematic point of view it could well be endorsed by Thorndike and Woodworth. Some sections of the book, notably those dealing with motivation, personality, adjustment of the backward and the gifted, will probably be well received by the "progressive" wing of American education, although again there has been no overt attempt to appeal to this group. "Progressive education" is not

conspicuously mentioned. The book is, however, quite modern in its fundamental educational outlook.

In Chapter 1 the student is favorably introduced to educational psychology. Chapter 2 combines much of the content presented in Chapter 2, Inherited Nature, and Chapter 12, Family and Environment, of the second edition. Some of the recent material regarding the IQ controversy is presented. The section on chromosomes, genes, etc., is retained. On the whole this chapter will probably prove to be interesting to the student.

There follow five chapters on learning. This conforms to the previous editions except for the omission of the chapter on elementary school subjects. Chapter 3, General Principles of Learning, treats chiefly nervous structure, conditioning, the traditional laws of learning, learning curves, and retention, the latter not very adequately, although some further attention is given this topic in a later chapter. The law of effect is not adequately treated. Chapter 4, Conditions of Learning, treats physiological conditions; psychological conditions, chiefly interests—a very good section; and educational conditions. Chapter 5, How to Study, is rather weak (what treatment of this topic is not!). In the chapter on transfer of training more might well have been made of the role of this basic phenomenon in mental development, and, in the language of James, of the pervasiveness of the phenomenon. No mention is made of the analytical investigations of the last decade, which might just as well be in a text for undergraduates. The treatment of transfer of school experiences, Chapter 7, is essentially the same as in the second edition—a condition that is true in large measure of all five chapters on learning.

Chapter 8, Individual Differences, is virtually identical with the previous editions. Chiefly it treats sex differences—only physical capacity and interests, adequately—and race differences. Maturation or Growth, Chapter 9, is considerably expanded over the previous edition, and is quite competent. Some of the topics expanded or added are emotions and interests, reading habits, and vocabulary and sentence structure. Personality Adjustment, Chapter 10, has been expanded a bit over the corresponding chapter in previous editions, and is quite polished. Chapter 11, Adjustment of the Backward and Gifted, is adequate. The chiefmodification of the chapter on statistical method is the addition of a section on percentiles. To the treatment of intelligence tests there have been added, chiefly, accounts of the New Stanford-Binet and the constancy of the IQ.

The treatment of achievement tests, Chapter 14, is rather on the poor side. It gives the student some knowledge of the concepts and parlance of measurement, but is unlikely to be of much help to the teacher in his own testing procedures. It portrays educational measurement of the 1920's. The final chapter, Measurement of Personality Traits, is good, although there is some question about its appropriateness. It is too much to expect teachers to make much use of the data. However, it does supply the student with some further knowledge of personality and its conditions.

The revision consists chiefly, and most importantly, in supplementation. Much, perhaps the larger part, of the text is more or less identical with that of the second edition. The supplementation, which is frequently made by way of adding paragraphs or pages at the end of various sections of chapters, is skillfully made. There is, to be sure, some reorganization of

the chapters, a few pictures lend human interest, and the chapter and topic headings are more attractive than formerly. In some instances the orientation at the beginning of chapters has been improved.

J. B. STROUD.

State University of Iowa.

MURPHY, LOIS BARCLAY; LERNER, EUGENE; JUDGE, JANE; AND GRANT, MADELEINE. Psychology for individual education. (Edited by Esther Raushenbush). Sarah Lawrence College Publications. New York. Columbia University Press, 1942. Pp. x+306.

Written in symposium form, *Psychology for Individual Education* is essentially a critical evaluation of principles, methods, and teaching experience in a cooperative exploratory course in psychology at the freshman level. In recognition of the fact that entering students are deeply interested in problems of personal development and adjustment, from their own adolescent point of view, the materials of the course are heavily weighted on the clinical, social, and sex-physiology side. Only such traditional and technical materials seem included as will clarify these more practical issues of ordinary living.

The teaching methods use case-history and mock-council techniques, supplemented by field trips and laboratory demonstrations. The cooperative demonstrations in biology seem especially effective. Instruction is highly individualized, on the basis of personality type and previous experience. Topics are selected primarily on the basis of student interest. From the authors' conclusions, one is convinced that such an elementary exploratory course is of decided practical value to entering college students. On the other hand, there is always the danger that such general orientation courses may supersede or block the more tedious, difficult, but absolutely necessary basic disciplines of "pure" psychology.

Because of its very simple, non-technical, informal presentation, the book should have a wide appeal to parents, teachers, mental hygienists, and others primarily interested in the practical problems of guidance and personality. It should likewise interest all teachers of elementary psychology courses.

From the point of view of materials and organization, Chapter I is outstanding.

MARTHA GUERNSEY COLBY.

University of Michigan.

SEASHORE, ROBERT H. (Ed.) Fields of psychology: an experimental approach. New York: Henry Holt, 1942. Pp. iii+634.

The expanding literature and the increasing degree of specialization have created an enormous gap between the textbooks and the research substance of psychology. Two general classes of efforts have been made to bridge this gap: (1) books have been written describing specific experiments or groups of experiments in the traditional field of "general" psychology; (2) other books have reviewed in generalized fashion the materials included within each of the special branches. Seashore and his ten collaborators present the first volume devoted to specific experiments in

these special fields, as follows: general experimental (Buxton), physiological (Lindsley), comparative (Harlow), developmental (Wellman), educational (Wolfle), vocational (Williamson), industrial (Musgrave), avocational (H. G. Seashore), social (Farnsworth), abnormal and clinical (Conklin), systematic (R. H. Seashore).

The authors propose to portray the breadth and diversity of modern psychology, and at the same time to create a picture of essential unity. The editor adopted two devices as means of achieving the latter goal. First, each of the major sections of the book would illustrate how *experimental methods* had been applied in the several special fields, and thus the book would have methodological unity. But the editor did not rely entirely upon the hope that the student would perform the difficult task of educational generalization spontaneously. In an introductory chapter, and in two concluding chapters upon convergent trends in theory and experimentation, he attempts to explicate the meaning of such an integrated outlook in psychological science. These conceptions of editorial responsibility represent a decided advance over practices found in previous books of this general type, even though the unity sought is imperfectly achieved.

The reader with a strict methodological conscience will worry about the use of the term "experimental" as applied to many of the investigations. For here the term experimental denotes almost any kind of empirical investigation. In addition to studies conforming to the traditional logical structure of a scientific experiment there are studies in factor analysis, a description of the University of Chicago "experiment" in undergraduate education, vocational guidance procedures, personnel procedures, and an account of the more widely used personality inventories. From the point of view both of psychologists and of psychology students, wouldn't it be better to restrict the term "experiment" to the kinds of scientific behavior regularly denoted by this term in the universe of scientific discourse? This attitude does not imply a disparagement of these other kinds of investigation, many of which must precede genuine experimentation, and which often are the only kinds of investigation possible.

It is perhaps a moot pedagogical issue, with books of this type, whether the account of a specific experiment should indicate its general scientific setting and status. The procedure in the present volume varies among the several authors, but there is one outstanding case of failure to suggest the highly controversial nature of the interpretations presented. This instance is Wellman's section on developmental psychology, which consists principally of an account of certain Iowa studies on the variability of the IQ. It could be argued, as the editor suggests in his preface, that the results of an investigation should be left to speak for themselves. But these results are quite definitely interpreted to speak for the author's point of view, without even a footnote reference to criticisms. In striking constrast, Lindsley's section on physiological psychology is a careful and scholarly appraisal of the specific experiments in relation to their setting in the larger scientific field. In similar fashion, if somewhat less systematically, Harlow, Wolfle, Williamson, Farnsworth, and Conklin all manage to establish a broad educational orientation in the field as a whole.

(Conklin does however fail to mention the criticisms of Maier's work on audiogenic seizures.) To the degree that this desideratum is not realized, the authors of such a volume become mere abstractors, and the product is likely to be misleading to students and troublesome to instructors.

But when this collective effort is viewed as a whole, its assets definitely outweigh its liabilities. Despite the unevenness in the quality of the writing and in the choice of representative experiments, the reader will carry from it a lively realization of the broadening scope of modern psychology. Furthermore, the student will learn far more about how psychologists actually carry on their work than he could ever discover in a textbook of second-hand generalizations. Like good research films, the many excellent individual chapters, too numerous to mention, will be invaluable in supplementing lectures and textbook readings.

LYLE H. LANIER.

Vassar College.

MILLER, JAMES GRIER. Unconsciousness. New York: John Wiley and Sons, 1942. Pp. vi+329.

According to the author there are two ways by which unconsciousness may be studied. One, and by far the most common, is by the clinical method. The other is by the experimental method. There is some tendency to combine these methods, but the tendency is not as great as it should be.

In considering what is meant by unconsciousness sixteen different definitions are presented ranging all the way from inanimate or subhuman to unavailable to awareness. No one of these definitions is accepted as correct but any one can be meant when the term unconsciousness is used. In later discussions where any particular meaning is desired it is indicated in bold faced type.

The usual method of studying the unconscious (any meaning) has been by introspection. Such a method presents a paradox for how can unconsciousness be studied by conscious (attentive) methods. But such a method together with the case history method is defended along with the experimental method.

The neurophysiology of unconsciousness presents a serious difficulty. One theory locates consciousness in the cerebrum and unconsciousness in the thalamus. The evidence for this theory is based upon such things as Pavlov's experiments in conditioning and the pathological studies of Cannon and Bard. But all this evidence is "suggestive rather than convincing." Other writers have presented the theory that both consciousness and unconsciousness are located in the periphery, some claim in the receptors and others in the effectors or possibly still others would locate it more accurately in the whole neuromuscular system. The difference between consciousness and unconsciousness by this theory is to be explained in terms of neural vigilance.

When unconsciousness is defined as unavailable to awareness or unresponsive to stimulation some of the best methods of study are through hypnosis, sleep, anaesthesia, dreams and reverie. Although the evidence

is not conclusive most of such studies favor the lowered vigilance theory of the unconscious.

The study of limens was the first psychological problem to be investigated by elaborate statistical techniques. Much experimental evidence has shown that subliminal stimuli may affect behavior. For example, Collier found that geometrical figures in the periphery of vision and subliminal were selected from a series of figures much more often than could be accounted for by chance. This and other studies show that subliminal (unconscious) stimuli can affect behavior. The range of attention is also related to unconsciousness. The psychoanalysts have claimed a distinct demarcation between consciousness and unconsciousness. Studies of attention indicate that the differences are those of degree with complete awareness at one end of the continuum with complete ineffectiveness at the other, with degrees of attention (unconsciousness) between these extremes.

Of all the uses of the term unconsciousness one of its most important is in explaining associations in thinking. Why do we pass from one idea to another? Often the associations are not apparent. It seems probable that there are missing links in our chain of thought that are unconscious and yet they determine the course of our thoughts. In a somewhat similar way unconscious (insightless) elements often determine our best judgments. Great thinkers may arrive at profound truths by methods quite unknown to them. Some believe this is due to unconscious but nevertheless accurate thinking.

There is surprisingly little psychoanalytic emphasis in this text. Although reference is made from time to time to Freud and to psychoanalysis, this book is predominantly not a psychoanalytic approach to the unconscious.

The text is clearly and interestingly written. It is well documented and draws from many realms of knowledge. Possibly its most serious fault is the fact that the evidence on both sides of controversial issues is presented without an attempt to reach a conclusion. To some readers this will be considered a virtue. For those who wish a clear untechnical presentation of the facts concerning the various meanings of the unconscious and its significance in life, this text is recommended.

A. R. GILLILAND.

Northwestern University.

BOOKS AND MATERIALS RECEIVED

ABEL, T. M., & KINDER, Elaine F. The subnormal adolescent girl. New York: Columbia University Press, 1942. Pp. xii+215.

KATONA, G. War without inflation. New York: Columbia University Press, 1942. Pp. x+213.

MENNINGER, K. Love against hate. Harcourt, Brace, 1942. Pp. ix+311.

RAY, Marie B. Doctors of the mind. Boston: Little, Brown, 1942. Pp. xii+335.

SCHILDER, P. Mind: perception and thought in their constructive aspects. New York: Columbia University Press, 1942. Pp. xii+432.

TOLMAN, E. C. Drives toward war. New York: Appleton-Century, 1942. Pp. xiii+118.

Bureau of Child Study and the Chicago Adjustment Service Plan (p. 391–430); High School Adjustment Service (p. 175–197); Chicago Tests of Primary Mental Ability (p. 148–150); Statistical Report Bureau of Child Study (p. i–xix). Four reprints from the Annual Report of the Superintendent of Schools 1940–41, bound in one volume. Chicago: Board of Education, 1940–41.

NOTES AND NEWS

The retirement of DR. GRACE E. BIRD, for many years professor of educational psychology at Rhode Island State College of Education, has been announced. DR. BIRD has been appointed professor emeritus.

DR. ERNEST R. HILGARD, professor of psychology at Stanford University, was recently appointed head of the department of psychology to succeed DR. LEWIS M. TERMAN. DR. HILGARD is now on leave in Washington, D. C. In his absence, DR. PAUL R. FARNSWORTH, professor of psychology, will be acting head of the department.

DR. SALVATORE RUSSO, has been made head of the department of psychology at Rider College, Trenton, N. J.

DR. LEONA E. TYLER, instructor in psychology, University of Oregon, was elected secretary of the Northwest College Personnel Association, at its annual conference held October 9–10, 1942.

DR. CLIFFORD T. MORGAN, instructor in psychology at Harvard University, has been appointed assistant professor of psychology at the Johns Hopkins University effective July 1, 1943.

DR. CURT P. RICHTER, associate professor of psychobiology at the Johns Hopkins University, delivered the second Harvey Society Lecture of the current series at the New York Academy of Medicine on November 19. He spoke on "Total Homeostasis."

DR. MARCIA EDWARDS, associate professor of education, has been appointed assistant dean, College of Education, University of Minnesota.

DR. LEO A. HELLMER, consulting psychologist at the Wichita Guidance Center, has been granted a leave of absence for the duration to enter the armed services. MISS AUDELL HERNDON, of Ohio State University, joined the staff of the Wichita Guidance Center as consulting psychologist, September 14, 1942.

DR. RICHARD S. SOLOMON has been appointed Director of Personnel and Psychological Research of the Standard Register Company, Dayton, Ohio. He was formerly Director and Vice President of The Personnel Institute, Chicago, Illinois.

NOTICE

Because of the space requirements of the Psychology and War section, and the necessity of equalizing the pages in successive issues, the *Psychological Bulletin* from time to time needs critical and analytical reviews that will run from 10 to 16 printed pages (i.e. from 4,000 to 7,000 words) to supplement its customary critical reviews which usually run from 28 to 36 printed pages (i.e. from 11,000 to 15,000 words). Psychologists interested in preparing such reviews or who now have such reviews available are invited to correspond with the editor. There is also available a mimeographed statement regarding the preparation of articles for the Bulletin and another with regard to Book Reviews which will be sent to interested persons on request.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of PSYCHOLOGICAL BULLETIN published monthly (not Aug. or Sept.) at Menasha, Wisconsin, and Evanston, Illinois for 1942–43.

State of Illinois } ss.
County of Cook }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Willard L. Valentine, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the Psychological Bulletin and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, American Psychological Assn., Inc., Evanston, Illinois; Editor, John E. Anderson, Minneapolis, Minnesota; Managing Editor, none; Business Manager, Willard L. Valentine, Evanston, Illinois.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) American Psychological Assn., Inc., Evanston, Illinois, (no stockholders).

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is (This information is required from daily publications only.)

American Psychological Assn., Inc.

Sworn to and subscribed before me this 7th day of October 1942.

SEAL]——————————————HARRIET HIEHS THOMPSON

(My commission expires Mar. 17, 1945.)